Thesis/
Reports
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PROGRESS REPORT

Fiscal Year

1978

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Bridger Plant Materials Center

to the

U.S. FOREST SERVICE

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This report was prepared by the United States Department of Agriculture, Soil Conservation Service, Bridger, Montana Plant Materials Center in cooperation with the United States Forest Service, Surface Environment and Mining Program, United States Department of Agriculture.

September 1978

PRELIMINARY DATA NOT FOR PUBLICATION

This is a progress report of cooperative investigations containing data, the interpretations of which may be modified with additional evaluations. Publication, display, or distribution of any data or statement herein is prohibited without prior written approval of the cooperating agencies concerned.

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FOREWORD

The Bridger Plant Materials Center is a federally operated establishment under the administration of the Montana State Office of the Soil Conservation Service. It operates under a cooperative agreement with the Soil and Water Conservation Districts of Montana, Incorporated and the Wyoming Association of Conservation Districts. The Center has cooperative agreements for plant testing and development with Montana State University, the University of Wyoming, and SUNOCO Energy Development Company (SUNEDCO). The acceleration of plant materials work for surface mine reclamation is possible with cooperative agreements with the Forest Service Surface Environment and Mining Program, and the Environmental Protection Agency. The Center also has a cooperative agreement with the Soil and Water Conservation Districts of Montana, Incorporated to develop plant materials for reclamation of saline seeps.

The Bridger PMC was established in 1959 to serve 104 conservation districts in Montana and Wyoming. It is located on an 110-acre irrigated farm 3-1/2 miles southeast of Bridger, Montana. Initial and advanced evaluations of new plant materials and seed increase plantings of promising accessions are located at this site. Field Evaluation Plantings are conducted off the Center at problem sites in the two states in cooperation with federal, state, and municipal agencies, and private individuals. Approximately 176 field plantings of grasses, legumes, and woody plants

are located on farms and ranches where over 45 accessions of promising conservation plant materials are being evaluated.

WEATHER 1977

Precipitation received from January 1 through December 31 was 7.18 inches (table 1). This is 3.94 inches below the long-term mean of 11.12 inches. This was the fifth driest year on record since 1909. Only in 1919 (7.14 inches), 1934 (7.15 inches), 1959 (6.88 inches), and 1960 (6.77 inches) was less precipitation received than in 1977. Effective precipitation in 1977 was very little. We recorded moisture on 98 days. Only 9 days had more than 1/4 inch of precipitation, and only two of these days were consecutive.

The average yearly mean temperature was 1.7°F above the long-term mean. The mean monthly temperature from February to July was above normal.

Total number of thermal units (°F > 55) for March through September was 3753. This is 297 above the 1966-1976 average of 3456.

TABLE 1. Weather Data. Mean monthly temperatures, monthly precipitation, wind movement, cloud cover, and relative humidity at the Bridger Plant Materials Center.[1/]

Month	Mean Monthly Temperature				Total Monthly Precipitation				Mean Monthly			
	°F Max.	°F Min.	°F Mean	Dep. from Long-term Mean	1977	Long-term Mean	Dep. from Mean	No. Days Ppt.	Cloud Cover %	Wind Vel. *mph*	Wind Direction	Relative Humidity %
January	31	12	21.5	- .7	.04	.43	- .39	7	70	10	SW-N	54
February	44	20	32.0	+4.5	0	.33	- .33	0	55	12	N-S	47
March	45	25	35.0	+ .2	2.09	.64	+1.45	13	66	10	N	53
April	63	34	48.5	+3.3	.06	1.27	-1.21	2	37	9	N	67
May	69	42	55.5	+ .9	1.47	1.74	- .27	9	70	11	S-N	71
June	83	53	68.0	+5.1	.37	1.91	-1.54	12	50	7	N	60
July	85	56	70.5	+ .4	.23	.77	- .54	10	44	7	NE-SE	50
August	77	50	63.5	-4.7	1.71	.72	+ .99	14	60	6	N	57
September	71	42	56.5	-1.6	.17	1.34	-1.17	9	40	6	N-NE	58
October	62	35	48.5	+ .8	.59	1.05	- .46	5	56	13	N	53
November	43	21	32.0	-3.2	.03	.51	- .48	5	70	12	N	63
December	32	14	23.0	-3.3	.42	.41	+ .01	12	70	12	N	76
Yearly Total					7.18	11.12	-3.94	98				
Monthly Average	59	34	46.2	+1.7					57	9.6	N	59

1/ Data is recorded at 3:30 p.m. daily.
28°F growing season, 152 days, May 5 to October 3.
High temperature 101°F July 17, low temperature -15°F December 8 and 9.
Record high 110°F, record low -35°F.

SEAM PROGRAM

This program is an acceleration of the Plant Materials Program in Montana and Wyoming for the development of plant materials for use in surface mine reclamation. It is funded through a cooperative agreement with the Forest Service Surface Environment and Mining Program (SEAM).

The following studies were accelerated by the SEAM agreement. The results of these studies are reported elsewhere in this Progress Report.

Project I. Initial Evaluations
- A. Four *Lotus* species
- B. Grasses for reclamation of mined lands, 1975
- C. Legumes for reclamation of mined lands
- D. Grasses for reclamation of mined lands, 1977
- E. Browse species for reclamation of mined lands, 1977

Project II. Initial Seed Increase
- A. Initial seed increase plantings

Project IV. Management Trials
- A. Water requirements of Arnold hawthorn

Project V. Comparative Performance
- A. Adaptation and performance of prairie sandreed on a dryland site
- B. Adaptation and performance of bluebunch wheatgrass on a dryland site
- C. Adaptation and performance of Indian ricegrass on a dryland site
- D. Big Horn Ranch FEP
- E. Cordero Mine FEP

Project VI. Cultural Trials
- A. Effects of irrigation on the establishment of woody species
- B. Influence of kinds of stock on the establishment of woody species

Project VII. Secondary Seed Increase
- A. Seed increase for field plantings and foundation seed stocks

Project VIII. Woody Plantings
- A. Adaptation and performance of trees and shrubs, 1960

B. Adaptation and performance of trees and shrubs, 1976
C. Propagation of woody species for reclamation of mined lands, 1977

Project IX. Seed Processing Trials
A. Inter-Center seed longevity study

The Plant Materials Field Planting Program in Montana and Wyoming was also accelerated. Existing surface mine and other critical area plantings were evaluated. Seed of 32 accessions, totaling 265 pounds, was shipped to mining companies or researchers for testing on mined lands.

Work was continued on the computerization of plant materials data. Data from Initial Evaluations at the Bridger PMC from 1959 to 1976 has been put on computer tape. A program has also been written to reformat and retrieve this data. The data from Initial Seed Increase and single species field plantings has also been transferred to computer tape.

PROJECT I

INITIAL EVALUATIONS OF NATIVE AND INTRODUCED GRASSES, LEGUMES, AND FORBS FOR USE IN SOIL AND WATER CONSERVATION

ABSTRACTS

Initial Evaluation of Four *Lotus* Species

Sixty-six accessions of four *Lotus* species were planted June 13, 1975, at the Bridger PMC. These accessions are being evaluated for reclamation of mined lands and other forage-producing and soil-stabilizing uses.

Ninety percent of the accessions planted in 1975 remained established this year.

The best performing accessions for each species were:

Lotus corniculatus birdsfoot trefoil. PI-196539 from Lodi, Italy, 'Cascade' from the Corvallis, Oregon PMC, and PI-315455 from the USSR.

Lotus corniculatus var. *arvensis*. 'Kalo' (previously P-15655) from the Corvallis, Oregon PMC.

Lotus frondosus. PI-316272 from Australia and PI-314091 from the USSR.

Lotus pedunculatus big trefoil. No accession performed satisfactorily.

Lotus tenuis narrowleaved trefoil. 'Los Banos' from the Corvallis, Oregon PMC. This single entry was fair to poor in performance ratings, with only a 20% stand remaining this year.

Initial Evaluation of Grasses for Reclamation of Mined Land - 1975-76

Five hundred ten accessions of 115 grass species were planted November 11, 1975, at the Bridger PMC. An additional 28 accessions

and 10 more species were planted May 19, 1976. The fifty-one entries that showed promise this year are listed on table 3. They are being evaluated primarily for reclamation of mined land.

Initial Evaluation of Legumes for Reclamation of Mined Land

One hundred sixteen accessions of 49 legume species were planted May 18, 1976, at the Bridger PMC. (One number was added to the planting March 18, 1977.) They are being evaluated primarily for reclamation of mined land. The twenty-three numbers that exhibited promise this year are marked on table 4.

Initial Evaluation of Grasses for Reclamation of Mined Land - 1977

Sixty-four accessions of 32 grass species were planted April 1, 1977, at the Bridger PMC. They are being evaluated for reclamation of mined lands, range revegetation, and soil stabilization. The eight entries that displayed establishment-year promise are noted on table 6.

Initial Evaluation of Browse Species for Reclamation of Mined Land

One hundred seventy-nine accessions of 81 species were planted on April 6, 1977. These accessions are being evaluated for potential use in revegetation of mined land and range revegetation.

The planting was a failure in 1977 due to poor seedling emergence. This planting should have been made in the fall or under the mist sprinkler system.

PROJECT II

INITIAL SEED INCREASE OF PLANT MATERIALS

ABSTRACTS

Initial Seed Increase

Seven accessions were maintained for seed production in 1977. Breeder seed was produced of 'Tretana' birdsfoot trefoil and 'Troy' Kentucky bluegrass in cooperation with Montana State University.

Five accessions were plowed out this year with adequate seed on hand for further evaluations. Twenty additional entries were planted this year to develop or replenish seed supplies.

PROJECT IV

MANAGEMENT OF GRASSES, LEGUMES, SHRUBS, AND TREES FOR SOIL AND WATER CONSERVATION USES

ABSTRACT

Water Requirements of Arnold Hawthorn

This study was established in the spring of 1970 at the Bridger PMC to determine the minimum water requirements of Arnold hawthorn. A row of 72 plants was established and divided into four treatment sections with 18 plants in each. One treatment receives natural precipitation. The other three treatments receive 3, 6, or 9 acre-inches of supplemental irrigation water during the growing season.

The increase in leader growth was only 42% of the growth in 1977. Cumulative measurements for the four treatments displayed a step-like decline in growth, with the nonirrigated treatment measurably shorter in overall growth than the three irrigated treatments. Significant differences in growth corresponding to the amounts of moisture received were not evident.

PROJECT V

COMPARATIVE PERFORMANCE TRIALS

ABSTRACTS

Adaptation and Performance of Prairie Sandreed on a Dryland Site

This report is being omitted this year.

Adaptation and Performance of Bluebunch Wheatgrass on a Dryland Site

Twelve accessions of *Agropyron spicatum* bluebunch wheatgrass and two accessions of *A. inerme* beardless wheatgrass were planted May 1, 1974, in individual five-row plots, 5 feet wide and 14 feet long, replicated three times.

The purpose of the study is to evaluate stand establishment and comparative forage-producing abilities of these accessions in order to select an ecotype for use in range seedings.

Two bluebunch wheatgrass accessions, M-161 from Montana and P-7412 from Oregon, failed to establish in 1974.

The dry matter yields of P-6409 and PI-232127 *A. spicatum* and PI-285272, a mixture of *A. inerme* and *A. spicatum*, were significantly higher than the other nine accessions. The average yield in 1977 was 56% lower than in 1976.

Adaptation and Performance of Indian Ricegrass on a Dryland Site

Eight accessions of *Oryzopsis hymenoides* Indian ricegrass were planted March 1, 1974, at the PMC in individual five-row plots, 5 feet wide and 14 feet long, replicated four times.

The purpose of the study is to evaluate stand establishment, and determine comparative foliage-producing abilities of an ecotype

to use for erosion control purposes on sandy and shaley soils under dryland conditions.

Stands remained essentially the same as they were in 1976. The average dry matter production of all accessions was 59% lower than the 1976 average. There were significant differences in yields of the eight accessions.

Big Horn Ranch Field Evaluation Planting

Part I

Seventy-three accessions of grasses, legumes, forbs, and shrubs were planted at a field site 16 miles south of Buffalo, Wyoming, on April 14, 1976. They were evaluated for stand, vigor, forage and seed production, ability to spread, ground cover, spring recovery, drought tolerance, and winter injury.

Some of the more outstanding accessions were: 'Parkway' *Agropyron cristatum*, 'Critana' *Agropyron dasystachyum*, 'Nordan' *Agropyron desertorum*, C-29 *Agropyron spicatum*, 'Primar' *Agropyron trachycaulum*, 'Luna' *Agropyron trichophorum*, P-15584 *Andropogon scoparius*, and NB-328 *Elymus giganteus*.

Part II

Twenty-eight accessions were seeded in a three-replication study on April 28, 1977. Each plot is 7 feet wide and 300 feet long.

Those accessions having at least a 75% stand on July 14, 1977, were: 'Revenue' *Agropyron trachycaulum*, 'Critana' *Agropyron dasystachyum*, 'Whitmar' *Agropyron inerme*, 'Luna' *Agropyron trichophorum*, and 'Vinall' *Elymus junceus*.

PROJECT VI

CULTURAL AND ESTABLISHMENT TRIALS OF GRASSES, LEGUMES, AND FORBS

ABSTRACTS

Effects of Irrigation on the Establishment of Woody Species

One hundred ninety-two potted and 192 bareroot Colorado blue spruce plants were planted in a four-replication, split-plot design to determine the effects of four different irrigation treatments on their survival and growth.

The various irrigation treatments, applied in 1976, had no effect on the growth or survival of either the potted or bareroot plants. After the second growing season, 56.7% of the potted transplants and 12% of the bareroot transplants were alive.

Influence of Kinds of Stock on Establishment of Woody Species

The purpose of this study is to evaluate the rate of establishment, growth, and efficiency of four types of transplants: (1) tubelings in tinus pots, (2) tubelings in bee pots, (3) bareroot, and (4) potted plant material. Shrub species used were: (1) 'Pink Lady' *Euonymus bungeanus*, (2) A-12044 *Forestiera neomexicana*, and (3) WY-843 *Rhus trilobata*. Each treatment is replicated three times in a randomized complete block design. Each plot consists of eight plants. Transplanting was done on May 26, 1977. Each transplant was given 3 quarts of water at the time of planting.

The species appears to have more influence on survival than the type of transplant. The best survival was potted WY-843 *Rhus trilobata* and tinus A-12044 *Forestiera neomexicana* with 100%.

PROJECT VII

SEED INCREASE FOR FIELD PLANTINGS AND FOUNDATION SEED STOCKS

ABSTRACT

Thirteen accessions were grown for seed production on 33-1/2 acres in 1977. Lack of precipitation and the unavailability of irrigation water until late May resulted in lower than average seed yields.

Seed of 31 accessions were distributed from the Bridger PMC to mining companies for surface mine reclamation or to scientists doing research on surface mine reclamation.

PROJECT VIII

WOODY PLANTINGS

ABSTRACTS

Geographic Strain Studies of Woody Plants in Cooperation with Midwest PMCs

Accessions of *Fraxinus pennsylvanica lanceolata* green ash and *Rhus trilobata* skunkbush sumac collected at sites ranging from North Dakota to Texas are involved in this study. They were planted in 1960 in Field 8 at the Bridger PMC. Survival, growth, and plant vigor under irrigated conditions were reported in 1975. Their status is to be reported again in 1980.

Adaptation and Performance of Trees and Shrubs for Soil Stabilization, Beautification, and Wildlife

Initiated in 1960

Various species and accessions of trees and shrubs are being evaluated for soil protection, food and cover for wildlife, recreation, beautification, general utility, and associated uses. They are being grown under irrigation in Field 8 at the Bridger Plant Materials Center. Dates planted, survival, plant growth and vigor were shown in the 1975 report. The next report will be in 1980.

Adaptation and Performance of Trees and Shrubs for Soil Stabilization, Beautification, and Wildlife

Initiated in 1976

Thirty five species of trees and shrubs represented by fifty-six accessions are being evaluated for soil protection, reclamation of disturbed land, food and cover for wildlife, recreation, beautification, general utility, and associated uses. They are being grown under irrigation in the south part of Field H at the Bridger Plant Materials Center. The number of trees and shrubs planted and surviving in 1976 and remaining in September 1977 is shown on table 1 in the report.

Initial Propagation of Woody Species for Reclamation of Mined Land

One hundred fifty-three accessions of 51 tree and shrub species were planted in 1977 under a mist sprinkler system at the Bridger PMC. They are being evaluated for reclamation of mined land and shelterbelt use in Montana and Wyoming. The plant materials being propagated are listed on tables 2 and 3.

PROJECT IX

SEED AND PLANTING STOCK PRODUCTION AND PROCESSING TRIALS OF GRASSES, LEGUMES, AND FORBS

ABSTRACT

Inter-Center Seed Longevity Study

Seeds of 21 grasses, 3 legumes, and 1 forb harvested in 1969 are being stored at three PMC locations: Bridger, Montana; Aberdeen, Idaho; and Los Lunas, New Mexico. Annual germination tests are being made on the seed from all locations at the Montana State University seed lab.

After 8 years of storage, the germinations of individual species vary from location to location.

PROJECT I

INITIAL EVALUATIONS OF NATIVE AND INTRODUCED GRASSES, LEGUMES, AND FORBS FOR USE IN SOIL AND WATER CONSERVATION

The objective of Initial Evaluation Plantings is to determine the adaptation, value for soil and water conservation, and general utility of species, varieties, and ecotypes of grasses, legumes, and forbs obtained from (1) the native vegetation of the northern Rocky Mountains and plains, (2) exchange with other PMC's in the United States, (3) federal and state agencies, (4) commercial sources, and (5) foreign plant introductions.

Five Initial Evaluation Plantings were evaluated in 1977:

1. Initial evaluation of four *Lotus* species - established 1975.
2. Initial evaluation of grasses for reclamation of mined land - planted 1975.
3. Initial evaluation of legumes for reclamation of mined land - established 1976.
4. Initial evaluation of grasses for reclamation of mined land - established 1977.
5. Initial evaluation of browse species for reclamation of mined land - established 1977.

These plantings are established by the Bridger Plant Materials Center to first evaluate and observe the performance of a number of

plant species and as many accessions within each species as possible. Promising accessions of each species are advanced to Initial Seed Increase and further evaluation.

Initial Evaluation of Four *Lotus* Species

Sixty-six accessions of four *Lotus* species are being evaluated primarily for reclamation of mined lands. They are also being considered for other forage-producing and soil-stabilizing uses. Performance is being evaluated on seedling vigor, stand establishment, ground cover, plant uniformity, winter hardiness, forage production, and seed-yielding abilities. This initial evaluation work is being funded by SEAM and EPA.

Methods and Materials

A total of 66 accessions were seeded June 13, 1975, in Field 13 on the Bridger PMC. The variety 'Tana' *Lotus corniculatus* birdsfoot trefoil was chosen as the standard for comparison, with the realization that other released varieties are included that have shown equally good performance in the past. They can be expected to equal or exceed the performance of the standard in this planting. Each accession was seeded in a 16-foot row, with the rows spaced 3 feet apart.

Cultural practices provided during the growing season included irrigation of the study site on July 25 and September 19, 1977. Both manual and mechanical weeding and cultivation operations were performed throughout the season. The planting was swathed on August 1 to a 3-inch stubble height to allow regrowth data to be recorded.

Field notes were obtained on percent stand; foliage and seed production; plant uniformity and character; insect, disease, and

winter injury; plant vigor; cut recovery; flowering and maturity; spring recovery; and lodging and height. Flower color similarities and differences were also noted for the accessions. Performance was observed at regular intervals during the season.

The soil in the study area is a McRae clay loam of the Ustollic Camborthid subgroup, in the fine-loamy, mixed, mesic family.

Results

Ninety percent of the accessions planted in 1975 remained established this year. Two accessions of *Lotus corniculatus* (BN-8092-60 and BN-7654-63) originating from Beltsville, Md., winterkilled. Both of these displayed weak stands and only fair plant vigor in 1976. Light to heavy winter injury was apparent on other entries in the study. No injury from insects or disease was recorded. Refer to table 1 for compiled information on plant performance.

The best performing accessions for each species and notable features exhibited were as follows:

Lotus corniculatus birdsfoot trefoil. PI-196539 displayed the best overall development of any of the species rated. 'Cascade' from the Corvallis, Oregon PMC, and PI-315455 from the USSR were similar in performance, with excellent stands and plant vigor. They also showed good to excellent uniformity, ground cover, and cutting recovery. Good forage production was noted for these two accessions, while seed production was only fair. The remaining

top-rated accessions of *L. corniculatus* and their corresponding performance data are shown in table 1.

The best subspecies, var. *arvensis*, was 'Kalo' (previously P-15655) from the Corvallis, Oregon PMC. Stand, vigor, uniformity, and all other features were not as strong as in 1976. Performance ratings were only fair to good this year. The decrease in plant vigor and development may be attributed to winter injury. The other accession of *arvensis*, BN-7128, suffered severe winter injury, which resulted in complete loss of stand.

Lotus frondosus (common name unknown). PI-316272 from Australia and PI-314091 from the USSR developed more vigorous stands this year. Both accessions showed increases from 25% to 65%, respectively. Overall, however, the Australian accession proved to be superior. It displayed good to excellent plant vigor, seed production, cut recovery, and plant uniformity. PI-310412 from the USSR showed extensive damage to stand, vigor, and forage production due to winter injury.

Lotus pedunculatus big trefoil. None of the entries ever established stands. The initial accessions planted in June of 1975 never emerged, except for one plant of 'Marshfield,' which died during the winter of 1975-1976. Poor seed quality and/or poor seed viability from prolonged storage were suspected to be the reasons. A subsequent attempt at replanting 'Marshfield' in 1976 using new seed was again unsuccessful. A dense stand emerged, but all seedlings soon after died. It seems that this species lacks drought

tolerance, and also may not be too well adapted to alkaline soil conditions.

Lotus tenuis narrowleaved trefoil. 'Los Banos' from the Corvallis, Oregon PMC was the only entry of this species. Fair to poor forage production and plant uniformity were recorded, along with poor seed production and spring recovery. A 20% stand remains after suffering heavy winter injury.

TABLE 1. Project I. Initial Evaluation Plantings. Performance of 66 trefoil accessions grown on irrigated land at the Bridger PMC - 1977. Seeded 6/13/75.

Species	Acc. No.	Origin	Stand (%)	Vigor*	Seed Production*	Uniformity*	Ground Cover*	Cutting Recovery*	Spring Recovery*	Winter Injury*	Height (inches)	Bloom Date	Maturity Date	Flower Color	Forage Production & Character
Lotus															
corniculatus	Tana[1/]	Huntley Exp. Sta., MT	70	2	5	4	3	2	3	1	16	6-16	7-11	Yel.	4-E
corniculatus	M-831	Missoula Co., MT	50	4	3	3	2	5	5	1	14	6-24	7-25	Yel.	3-D
corniculatus	M-914	Treasure Co., MT	50	4	4	3	3	5	4	1	12	6-24	7-22	Yel.	3-D
corniculatus	Cascade	Corvallis PMC	70	2	5	2	3	2	3	1	15	6-15	7-11	Yel.	3-E
corniculatus	Cascade	Pullman PMC	90	1	6	2	3	1	2	0	15	6-13	7-12	Yel.	3-E
corniculatus	Granger	Corvallis, OR	60	2	5	5	3	2	3	1	14	6-19	7-12	Yel.	4-E
corniculatus	P-15057	Corvallis PMC	60	2	4	5	3	2	2	1	15	6-20	7-15	Yel.	3-D
corniculatus	Tretana[2/]	Pullman PMC	75	3	3	1	1	5	4	1	15	6-24	7-27	Yel.	2-D
corniculatus	PI-165799	South Korea	50	5	5	2	7	6	7	2	6	6-24	7-21	Yel.	7-D
corniculatus	PI-182770	Sweden	50	4	3	4	3	4	3	1	17	6-20	7-19	Yel.	4-E
corniculatus	PI-193725	Sweden	85	4	4	3	4	4	1[3/]	0	12	6-15	7-12	Yel.	5-D
corniculatus	PI-196539	Lodi, Italy	100	1	2	1	2	2	2	1	17	6-27	7-17	Yel.	2-E
corniculatus	PI-234692	Denmark	50	4	5	7	5	5	4	1	12	6-20	7-14	Yel.[4/]	6-D
corniculatus	PI-246730	Madrid, Spain	2 plts.	7	8	8	8	8	8	5	7	6-27	7-18	Yel.[5/]	8-D
corniculatus	PI-246734	Madrid, Spain	30	5	6	6	6	5	6	3	11	6-22	7-14	Yel.[6/]	7-E

1/ Standard for comparison.
2/ Originally P-15456.
3/ Earliest of all entries.
4/ Yellow flowers - 70%, orange - 30%.
5/ Most flowers yellow, trace orange.
6/ Yellow flowers - 60%, orange - 40%.
* Ratings 1 - 9 with 1 best.

TABLE 1. Project I. Initial Evaluation Plantings. Performance of 66 trefoil accessions grown on irrigated land at the Bridger PMC - 1977. Seeded 6/13/75. (Continued.)

Species	Acc. No.	Origin	Stand (%)	Vigor*	Seed Production*	Uniformity*	Ground Cover*	Cutting Recovery*	Spring Recovery*	Winter Injury*	Height (inches)	Bloom Date	Maturity Date	Flower Color	Forage Production & Character
corniculatus	PI-260011	Brazil	40	4	5	6	5	4	8	6	12	6-22	7-15	Yel. 7/	6-E
corniculatus	PI-283623	Australia	95	5	4	7	5	5	6	6	5	6-24	7-15	Yel. 6/	6-P
corniculatus	PI-283625	Australia	50	4	3	5	3	5	5	1	9	6-22	7-15	Yel. 8/	4-P
corniculatus	PI-285279	USSR	50	4	3	4	3	4	5	5	14	6-24	7-15	Yel. 8/	4-D
corniculatus	PI-285280	USSR	50	3	3	5	4	3	4	1	14	6-20	7-15	Yel. 8/	3-D
corniculatus	PI-285281	USSR	70	4	4	4	4	4	2	2	6	6-20	7-16	Yel. 8/	4-D
corniculatus	PI-285282	USSR	90	3	5	2	3	4	2	0	15	6-22	7-16	Yel. 5/	4-E
corniculatus	PI-285283	USSR	70	4	4	2	3	5	4	1	14	6-30	7-19	Yel.	4-D
corniculatus	PI-285284	USSR	60	3	6	5	3	4	3	1	14	6-22	7-15	Yel.	3-D
corniculatus	PI-286468	Japan	60	5	7	6	7	5	8	6	9	6-18	7-15	Yel.	7-E
corniculatus	PI-286469	Japan	50	5	7	4	6	6	8	6	5	6-22	7-20	Yel.	8-P
corniculatus	PI-290375	Hungary	50	3	4	7	4	4	5	2	3	6-20	7-15	Yel.	5-D
corniculatus	PI-290376	Hungary	50	3	5	3	3	3	5	1	15	6-23	7-17	Yel. 9/	4-E
corniculatus	PI-300015	South Africa	0												
corniculatus	PI-305508	Italy	60	3	5	2	3	3	3	2	14	6-21	7-15	Yel. 8/	3-D

5/ Most flowers yellow, trace orange.
6/ Yellow flowers - 60%, orange - 40%.
7/ Yellow flowers - 75%, orange - 85%.
8/ Yellow flowers - 80%, orange - 20%.
9/ Yellow flowers - 90%, orange - 10%.
* Ratings 1 - 9 with 1 best.

TABLE 1. Project I. Initial Evaluation Plantings. Performance of 66 trefoil accessions grown on irrigated land at the Bridger PMC - 1977. Seeded 6/13/75. (Continued.)

Species	Acc. No.	Origin	Stand (%)	Vigor*	Seed Production*	Uniformity*	Ground Cover*	Cutting Recovery*	Spring Recovery*	Winter Injury*	Height (inches)	Bloom Date	Maturity Date	Flower Color	Forage Production & Character
corniculatus	PI-315450	USSR	70	3	2	1	1	4	5	1	16	6-24	7-19	Yel. 8/	1-E
corniculatus	PI-315452	USSR	70	3	4	5	3	4	6	3	14	6-27	7-19	Yel.	3-E
corniculatus	PI-315453	USSR	70	4	6	5	6	7	7	2	4	6-27	7-17	Yel. 10/	7-P
corniculatus	PI-315454	USSR	50	4	7	5	4	4	5	1	12	6-24	7-14	Yel.	5-D
corniculatus	PI-315455	USSR	90	1	4	2	3	2	4	1	17	6-23	7-15	Yel. 11/	3-E
corniculatus	PI-316268	Australia	80	2	6	2	5	2	5	2	13	6-22	7-15	Yel.	4-E
corniculatus	PI-316269	Australia	90	2	4	2	4	3	5	3	12	6-21	7-17	Yel.	4-E
corniculatus	PI-319822	Norway	10 12/	7	4	4	6	6	8	3	6	6-21	7-18	Yel.	6-P
corniculatus	PI-322556	Brazil	10 12/	8	7	8	9	8	9	9	9	6-27	7-21	Yel.	8-E
corniculatus	BN-3197-67	Mulberry Island, VA	50	5	4	5	5	6	6	4	9	6-22	7-7	Yel.	5-D
corniculatus	BN-4423-61	NPMC, Beltsville, MD	80	4	3	4	4	5	6	3	10	6-27	7-19	Yel.	4-D
corniculatus	BN-5489	Winona, MN	70	4	3	6	5	5	6	2	8	6-27	7-21	Yel.	5-D
corniculatus	BN-6249-67	Bellingham, WA	60	3	5	3	3	3	3	1	13	6-21	7-15	Yel.	3-E
corniculatus	BN-7036	Ames, IA	30	4	3	5	4	5	6	2	9	7-18	7-29	Yel.	5-D
corniculatus	BN-7654-63	Beltsville, MD	0												

8/ Yellow flowers - 80%, orange - 20%.
10/ Yellow flowers 95%, orange - 5%; colors on same plant.
11/ Mostly yellow flowered, with few yellow/orange bicolored flowers.
12/ Only trace of plants.
* Ratings 1 - 9 with 1 best.

TABLE 1. Project I. Initial Evaluation Plantings. Performance of 66 trefoil accessions grown on irrigated land at the Bridger PMC - 1977. Seeded 6/13/75.

Species	Acc. No.	Origin	Stand (%)	Vigor*	Seed Production*	Uniformity*	Ground Cover*	Cutting Recovery*	Spring Recovery*	Winter Injury*	Height (inches)	Bloom Date	Maturity Date	Flower Color	Forage Production & Character
corniculatus	BN-8092-60	Beltsville, MD	0												
corniculatus	BN-8122-52	Boulder, CO	20	7	8	7	9	5	9	8	4	6-27	7-29	Yel.[5/]	9-P
corniculatus	BN-8568-68	Denmark	75	2	6	3	4	2	4	2	14	6-20	7-17	Yel.	4-E
corniculatus	BN-13548-64	West Virginia	70	2	3	2	2	3	5	2	11	6-27	7-19	Yel.	3-D
corniculatus	BN-13549-64	Allegany Co., MD	70	3	2	3	2	3	5	1	11	6-27	7-20	Yel.	3-D
corniculatus	BN-13550-70	Allegany Co., MD	80	4	2	1	2	4	5	1	12	6-28	7-22	Yel.[5/]	2-D
corniculatus	BN-14762-66	Chautauqua Co., NY	85	3	4	2	5	3	5	1	13	6-20	7-16	Yel.[8/]	5-E
corniculatus	BN-14893-70	Canada	70	2	3	2	2	3	2	0	17	6-24	7-16	Yel.[8/]	1-E
corniculatus	BN-18717-67	Vermont	30	1	4	2	3	1	2	0	15	6-22	7-15	Yel.	3-D
corniculatus	BN-18975-65	New York	85	3	3	2	1	4	5	2	16	6-27	7-22	Yel.	2-E
corniculatus	BN-20404-70	Iowa	70	3	3	2	2	4	6	3	17	6-29	7-17	Yel.	2-E
corniculatus	BN-20867-74	France	50	3	5	5	5	3	6	4	13	6-24	7-16	Yel.	5-E
corniculatus var. *arvensis*	Kalo[13/]	Corvallis PMC	60	4	4	3	3	4	5	2	12	6-23	7-14	Yel.	5-E
arvensis	BN-7128	Beltsville, MD	0												

[5/] Most flowers yellow, trace orange.
[8/] Yellow flowers - 80%, orange - 20%.
[13/] Originally P-15655.
* Ratings 1 - 9 with 1 best.

TABLE 1. Project I. Initial Evaluation Plantings. Performance of 66 trefoil accessions grown on irrigated land at the Bridger PMC - 1977. Seeded 6/13/75. (Continued.)

Species	Acc. No.	Origin	Stand (%)	Vigor*	Seed Production*	Uniformity*	Ground Cover*	Cutting Recovery*	Spring Recovery*	Winter Injury*	Height (inches)	Bloom Date	Maturity Date	Flower Color	Forage Production & Character
frondosus	PI-310412	USSR	30	7	5	3	8	7	8	8	10	6-20	7-19	Red[14/]	8-E
frondosus	PI-314091	USSR	80	2	3	4	4	1	5	1	6	6-24	7-21	Yel.	4-P
frondosus	PI-316272	Australia	90												
pedunculatus	Marshfield	Corvallis PMC	0												
pedunculatus	commercial	Sauvie Island, OR	0												
pedunculatus	Beaver	Corvallis PMC	0												
tenuis	Los Banos	Corvallis PMC	20	4	7	8	9	3	9	8	4	6-30	7-25	Yel.	6-D

14/ Most flowers red, 15% are yellow on same plant.
* Ratings 1 - 9 with 1 best.

TABLE 1. Project I. Initial Evaluation Plantings. Top performing accessions of *Lotus corniculatus* at Bridger PMC - 1977.

Species	Acc. No.	Origin	Stand (%)	Vigor*	Seed Production*	Uniformity*	Ground Cover*	Cutting Recovery*	Spring Recovery*	Winter Injury*	Height (inches)	Bloom Date	Maturity Date	Flower Color	Forage Production & Character
Lotus corniculatus	Tana 1/	Huntley Exp. Sta., MT	70	2	5	4	3	2	3	1	16	6-16	7-11	Yel.	4-E
corniculatus	Cascade	Pullman PMC	90	1	6	2	3	1	2	0	15	6-13	7-12	Yel.	3-E
corniculatus	Tretana 2/	Pullman PMC	75	3	3	1	1	5	4	1	15	6-24	7-27	Yel.	2-D
corniculatus	PI-196539	Lodi, Italy	100	1	2	1	2	2	2	1	17	6-27	7-17	Yel. 3/	2-E
corniculatus	PI-315450	USSR	70	3	2	1	1	4	5	1	16	6-24	7-19	Yel. 4/	1-E
corniculatus	PI-315455	USSR	90	1	4	2	3	2	4	1	17	6-23	7-15	Yel.	3-E
corniculatus	BN-13548-64	West Virginia	70	2	3	2	2	3	5	2	11	6-27	7-19	Yel.	3-D
corniculatus	BN-13550-70	Allegany Co., MD	80	4	2	1	2	4	5	1	12	6-28	7-22	Yel.	2-D
corniculatus	BN-14893-70	Canada	70	2	3	2	2	3	2	0	17	6-24	7-16	Yel. 5/	1-E
corniculatus	BN-18975-65	New York	85	3	3	2	1	4	5	2	16	6-27	7-22	Yel.	2-E

* Ratings 1 - 9 with 1 best.
1/ Standard for comparison.
2/ Originally P-15456.
3/ Yellow flowers - 80%, orange flowers 20%.
4/ Mostly yellow flowered with few yellow/orange bicolored flowers.

Initial Evaluation of Grasses for Reclamation of Mined Lands - 1975-76

Five hundred thirty-eight accessions of 125 grass species were planted in the fall of 1975 and spring of 1976 to be evaluated primarily for reclamation of mined lands. They are also being considered for other forage-producing and soil-stabilizing uses. Performance is being evaluated on seedling vigor, stand establishment, ground cover, plant uniformity, winter hardiness, forage production, degree of spreading from roots, and seed-yielding abilities. This initial evaluation work is being funded by SEAM and EPA.

Methods and Materials

Five hundred ten accessions were seeded November 11, 1975, on a clean, firm seedbed in Field 2 at the Bridger PMC. An additional 28 accessions were planted May 19, 1976. A standard for comparison, where possible, was planted for the various species. Each accession was seeded in a 16-foot row, with rows spaced 3 feet apart. The seed of several fall-planted accessions either all or partially blew away overwinter 1975-76 or were buried too deep to emerge as a result of persistent windy weather and a vulnerable soil surface. Seed was added to the row of a number of the fall-sown entries on May 19, 1976, from stock on hand.

Plant performance was observed periodically during the 1977 growing season and information recorded. The planting was cultivated three times during the year, as well as being hoed and rogued.

Irrigation water was applied to supplement natural precipitation. The accessions were irrigated three times in 1977. The planting was sprayed twice to control weeds using 2 lbs/acre of 2,4-D each time. No fertilizer was applied. All of the entries were permitted to grow to a post bloom stage, measured, and cut to a stubble height of 3 inches August 17, 1977. The residue was discarded.

Soil on the evaluation area is Lohler silty clay loam on a 0% to 2% slope. The surface 10 inches is a heavy clay loam. This layer is underlain with sandy clay to 60 inches deep. The soil materials are stratified below a depth of 20 inches. This deep soil is an Entisol of the subgroup Typic Ustifluvent, fine, montmorillonitic (calcareous), and frigid.

Table 2 shows the accession numbers, species, planting information, origin, and performance of the plant material being evaluated. The best performers are marked. They are also listed on table 3 with a common name.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand[1]	Vigor[1]	Forage Production[1]	Ability to Spread[1]	Seed Production[1]	Uniformity[1]	Ground Cover[1]	Cutting Recovery[1]	Spring Recovery[1]	Winter Injury[1]	Lodging[1]	Disease Injury[1]	Insect Injury[1]	Height (inches)	Maturity Date
Agropyron																	
albicans	M-787	Granite Co., MT	0														
**albicans*	M-1042	Chouteau Co., MT	9	1	3	3	3	-	3	4	1	0	0	0	0	32	-
albicans	M-1073[2]	McCone Co., MT	9	1	4	3	4	-	4	4	4	0	0	0	0	28	-
caninum	PI-297868	Romania	0														
caninum	PI-314612	USSR	0														
caninum	PI-314615	USSR	0														
caninum	PI-314616	USSR	0														
caninum	PI-314629	USSR	0														
cristatum	M-900	Golden Valley Co., MT	9	2	3	0	3	-	2	2	4	0	2	0	0	25	8-8
**cristatum*	WY-462	Big Horn Co., WY	5	1	1	0	1	1	1	1	1	0	0	0	0	36	8-4
cristatum	PI-109012	Turkey	0														
cristatum	PI-281862	Germany	0														
cristatum	PI-330685	Iran	0														
cristatum	PI-330686	Iran	8	2	3	0	3	2	3	2	1	0	0	0	0	35	8-10
cristatum	BN-7508-64	North Dakota	9	1	2	0	3	-	2	2	1	0	1	0	0	37	8-4
cristatum	Parkway	Northrup King Co.	2	1	2	0	2	1	2	1	1	0	1	0	0	31	8-6

* Best performer.

1/ Ratings: 1 - 9 with 1 best, 0 = none.

2/ Appear to be *A. smithii*.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
dasystachyum	M-1041	Chouteau Co., MT	2	2	5	5	5	3	3	3	3	0	1	8 3/	0	32	7-12
dasystachyum	WY-567 4/	Washakie Co., WY	8	1	6	0	5	1	6	9	3	0	5	2 3/	9	37	7-12
****dasystachyum**	Critana	Bridger PMC	1	1	3	4	3	2	1	1	1	0	4	6 3/	0	31	7-12
desertorum	WY-459	Big Horn Co., WY	9	2	1	0	2	4	2	1	2	0	1	0	0	32	8-10
desertorum	PI-277354	USSR	9	2	3	0	4	4	3	2	4	0	0	0	0	28	8-8
desertorum	PI-283162	England	0														
desertorum	PI-302993	Turkey	0														
desertorum	BN-15871-64	Tunisia	0														
****desertorum**	Nordan	Northrup King Co.	3	1	2	0	2	1	1	3	3	0	0	0	0	36	8-8
elongatum	PI-142012	USSR	0														
elongatum	PI-238222	Belgium	0														
elongatum	PI-264770	Germany	0														
****elongatum**	Alkar	Pullman PMC	3	1	1	0	1	1	1	1	1	0	0	0	0	55	8-19
elongatum	Orbit	Canada	5	1	2	0	2	2	1	1	1	0	0	0	0	51	8-18
****inerme**	Whitmar	Pullman PMC	1	1	1	0	1	1	1	1	1	0	3	4	0	35	7-18
intermedium	PI-261098	Spain	0														

** Best performer and also standard for comparison.

3/ Leaf & stem rust.

4/ Is *A. trachycaulum*.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
**_intermedium_	Greenar	Pullman PMC	3	1	1	3	2	1	1	1	1	0	0	0	0	56	8-9
*_intermedium_	Oahe	Brookings, SD	1	1	1	6	1	1	1	1	1	0	0	0	0	58	8-10
*_junceum_	PI-281863	Germany	1	1	1	3	3	2	1	1	2	0	0	0	0	56	8-5
junceum	PI-292581	Israel	0														
obtusiusulum	PI-261099	Spain	0														
pectiniforme	PI-326204	USSR	0														
pectiniforme	PI-326205	USSR	0														
*_pseudorepens_	M-1044	Blaine Co., MT	1	1	1	2	2	1	1	2	1	0	0	0	0	39	8-11
pseudorepens	M-1045	Blaine Co., MT	4	1	2	3	4	2	1	3	2	0	0	1 3/	0	31	8-10
pungens	A-12235	Los Lunas PMC	0														
*_repens_	M-1117	Carbon Co., MT	1	1	2	1	2	2	1	1	1	0	0	1 3/	0	34	8-8
repens	M-1278	Palmer, Alaska	0														
rigidum	PI-283169	Germany	0														
riparium	M-752	Hill Co., MT	0														
riparium	M-799	Meagher Co., MT	0														
**_riparium_	Sodar	Aberdeen PMC	2	1	4	4	3	1	2	2	1	0	5	7 3/	0	33	7-14

* Best performer.

** Best performer and also standard for comparison.

3/ Leaf & stem rust.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
scabrifolium	PI-297875	South America	0														
sibiricum	PI-281864	Germany	0														
sibiricum	PI-326206	USSR	0														
sibiricum	PI-326207	USSR	9	5	5	0	5	7	5	2	1	0	0	5 5/	2 5/	18	8-11
sibiricum	PI-326208	USSR	0														
**sibiricum*	P-27	Aberdeen PMC	8	1	2	0	2	1	1	1	3	0	0	0	0	35	8-10
smithii	M-677	Roosevelt Co., MT	9	3	5	3	6	5	4	4	4	0	0	0	0	24	8-10
smithii	M-742	Yellowstone Co., MT	0														
smithii	M-749	Gallatin Co., MT	2	2	4	2	5	3	3	3	2	0	0	1	0	28	8-19
smithii	M-751	Wheatland Co., MT	2	2	4	2	6	3	3	3	3	0	0	0	0	31	8-11
smithii	M-753	Wibaux Co., MT	9	4	5	5	8	3	4	6	4	0	0	1	0	23	8-17
smithii	M-757	Hill Co., MT	9	3	3	3	7	4	3	5	5	0	0	1	0	29	8-23
smithii	M-758	Silver Bow Co., MT	0	-	-	-	-	-	-	-	-	0	9	-	-	-	-
smithii	M-773	Pondera Co., MT	5	5	5	4	8	3	5	4	6	0	0	1	0	30	8-23
smithii	M-913	Prairie Co., MT	1	3	3	2	6	3	3	3	2	0	2	1	0	31	8-9
smithii	M-920	Yellowstone Co., MT	9	2	4	2	3	-	3	2	2	0	0	1	0	38	8-9

* Best performer.

5/ Fungus & cutworms.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
smithii	M-998	Stillwater Co., MT	5	4	4	3	6	5	5	3	6	0	0	1	0	36	8-10
smithii	M-1004	Stillwater Co., MT	1	2	3	2	5	5	3	3	3	0	0	1	0	30	8-9
smithii	M-1011	Prairie Co., MT	2	3	4	3	5	4	3	4	4	0	0	2 3/	0	33	8-10
smithii	M-1015	Rosebud Co., MT	2	2	2	3	4	3	2	4	4	0	0	1	0	34	8-10
smithii	M-1022	Silver Bow Co., MT	6	5	5	4	8	6	5	3	5	0	0	2 3/	0	22	8-10
smithii	M-1024	Deer Lodge Co., MT	7	3	4	5	7	5	4	4	5	0	0	3 3/	0	20	8-6
smithii	M-1032	Yellowstone Co., MT	***3	2	5	5	9	5	5	3	6	0	0	3 3/	0	13	8-10
smithii	M-1050	Phillips Co., MT	1	3	4	4	7	5	4	5	4	0	0	3 3/	0	28	8-10
**smithii*	M-1057	Valley Co., MT	1	2	2	2	4	2	2	3	3	0	0	2 3/	0	31	8-10
smithii	WY-377	Albany Co., WY	0														
smithii	WY-379	Carbon Co., WY	8	4	5	3	7	3	5	4	5	0	0	0	0	28	8-10
smithii	WY-390	Crook Co., WY	0														
smithii	WY-406	Fremont Co., WY	0														
smithii	WY-416	Fremont Co., WY	0														
smithii	WY-422	Fremont Co., WY	0														
smithii	WY-431	Uinta Co., WY	0														
smithii	WY-432	Crook Co., WY	0														
smithii	WY-433	Park Co., WY	9	1	2	4	4	2	1	3	4	0	0	1	0	36	8-15

* Best performer.

3/ Leaf & stem rust.

*** Major emergence 4/25/77.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
smithii	WY-434	Uinta Co., WY	0														
smithii	WY-435	Big Horn Co., WY	0														
smithii	WY-436	Crook Co., WY	9	7	7	1	9	-	8	5	5	0	0	1	0	12	8-19
smithii	WY-460	Big Horn Co., WY	9	7	7	4	0	-	7	6	6	0	0	0	0	10	0
smithii	WY-482	Platte Co., WY	2	2	3	2	5	4	3	3	2	0	0	1	0	30	8-12
smithii	WY-489	Campbell Co., WY	9	5	6	6	7	-	5	3	2	0	0	9 [5]	0	28	8-6
smithii	WY-506 [6]	Hot Springs Co., WY	9	2	2	0	5	-	2	1	1	0	0	0	0	31	8-1
smithii	SD-113	Meade Co., SD	7	3	3	3	4	5	3	3	4	0	0	1	0	35	8-10
**smithii*	Barton	Manhattan PMC	1	1	1	1	4	1	1	3	1	0	2	1	0	40	8-10
***smithii*	Rosana	Bridger PMC	1	1	1	2	4	1	1	2	1	0	0	2 [5]	0	34	8-8
smithii	Arriba	Los Lunas PMC	1	1	1	3	7	2	2	2	4	0	2	1	0 [8]	36	8-15
species	M-1019 [7]	Beaverhead Co., MT	4	6	7	0	6	2	6	6	3	0	3	0	5 [8]	31	6-28
species	PI-297896 [9]	Australia	8	1	2	0	2	1	2	2	1	0	2	0	0	27	8-11
species	PI-314622	USSR	0														
species	BN-18877-68	USSR	8	1	1	5	1	1	1	2	1	0	0	0	0	52	8-11

* Best performer.
** Best performer and also standard for comparison.
[5] Leaf & stem rust.
[7] Appears to be *A. spicatum*.
[8] Possibly cutworms.
[9] Appears to be *A. cristatum*.
[6] Plant is *Elymus junceus*.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
spicatum	M-887	Broadwater Co., MT	0														
spicatum	M-888	Stillwater Co., MT	0														
spicatum	WY-242	Fremont Co., WY	0														
spicatum	WY-501	Albany Co., WY	0														
spicatum	WY-590	Park Co., WY	5	2	4	0	3	2	3	3	2	0	1	4 1/	0	34	7-18
spicatum	WY-719	Big Horn Co., WY	6	7	-	-	-	5	6	-	6	1	-	5 1/	0	-	-
****spicatum**	P-15649	Bridger PMC	3	1	2	0	2	1	2	2	1	0	5	6 1/	0	33	7-18
tauri	PI-330689	Iran	9	3	6	0	0	5	6	2	5	0	0	0	0	29	-
tauri	PI-330690	Iran	9	4	6	0	0	-	7	2	4	0	0	0	0	-	-
trachycaulum	M-741	Hill Co., MT	0														
trachycaulum	M-745	Wheatland Co., MT	0														
trachycaulum	M-772	Pondera Co., MT	0														
trachycaulum	M-782	Prairie Co., MT	0														
***trachycaulum**	M-1030	Carbon Co., MT	1	1	2	0	1	1	1	1	1	0	0	5 1/	0	44	7-18
trachycaulum	M-1054	Valley Co., MT	4	1	1	0	2	1	1	2	2	0	0	3 1/	0	47	7-18
trachycaulum	WY-418	Park Co., WY	0														
trachycaulum	WY-425	Big Horn Co., WY	0														

* Best performer.

** Best performer and also standard for comparison.

1/ Leaf & stem rust.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Agropyron																	
trachycaulum	WY-438	Uinta Co., WY	0														
trachycaulum	WY-574	Fremont Co., WY	7	1	4	0	4	1	2	4	3	0	0	2 5/ 10/	0	48	7-18
trachycaulum	WY-578	Hot Springs Co., WY	6	2	3	0	3	1	2	2	2	0	1	7 10/	0	47	7-18
trachycaulum	PI-281865	Germany	0														
trachycaulum	Revenue	Canada	9	3	5	0	5	3	3	5	5	0	0	4 5/	0	38	7-18
trichophorum	PI-220498	Afghanistan	2	2	2	5	3	2	2	2	1	0	0	0	0	48	8-11
trichophorum	PI-293876	USSR	1	2	3	5	3	2	2	2	2	0	1	0	0	41	8-11
trichophorum	PI-326209	Los Lunas PMC	0														
**trichophorum*	Luna	Los Lunas PMC	1	1	2	5	2	1	1	2	3	0	1	0	0	57	8-11
**trichophorum*	Mandan-759	Bismarck PMC	3	1	1	5	1	1	1	1	2	0	2	0	0	57	8-11
trichophorum	Topar	Pullman PMC	3	1	2	5	3	1	2	3	4	0	0	1	0	54	8-11
Aeluropus																	
litoralis	A-1655	Los Lunas PMC	0														
Alopecurus																	
**pratensis*	P-5903	Pullman PMC	5	1	3	0	4	1	2	1	2	0	0	0	0	35	6-20
pratensis	Rhoena	Oregon	9	3	4	0	5	3	4	2	1	0	0	0	0	33	7-1
ventricosus	PI-314356	USSR	9	1	4	3	3	2	3	3	2	0	0	0	0	31	6-28

* Best performer.

5/ Leaf & stem rust.

10/ Fungus.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Andropogon																	
gerardii	WY-636	Crook Co., WY	0														
**gerardii*	NDG-4	Bismarck PMC	4	1	2	4	1	3	2	8	2	0	0	0	0	46	-
gerardii	SD-27	South Dakota	6	2	2	5	2	5	2	8	3	0	0	0	0	48	-
**hallii*	M-241	Roosevelt Co., MT	6	1	2	3	4	4	3	8	3	0	0	0	0	44	-
hallii	WY-641	Crook Co., WY	0														
hallii	Oshkosh	Nebraska	7	2	4	5	6	5	4	8	3	0	0	0	0	46	-
**ischaemum*	A-14207	Tucson PMC	4	4	5	0	4	6	5	6	4	0	0	0	0	32	-
scoparius	M-678	Treasure Co., MT	0														
scoparius	M-685	Fallon Co., MT	0														
scoparius	M-688	Wibaux Co., MT	0														
scoparius	M-696	Big Horn Co., MT	0														
scoparius	M-761	Prairie Co., MT	0														
scoparius	M-765	Big Horn Co., MT	0														
scoparius	M-769	Big Horn Co., MT	0														
scoparius	WY-443	Campbell Co., WY	0														
scoparius	WY-444	Crook Co., WY	0														
scoparius	WY-445	Crook Co., WY	0														
scoparius	WY-486	Platte Co., WY	0														
scoparius	WY-507	Crook Co., WY	0														

* Best performer.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Andropogon																	
scoparius	WY-637	Crook Co., WY	0														
scoparius	WY-644	Crook Co., WY	0														
scoparius	P-15584	Bridger PMC	9	1	3	0	2	1	2	7	5	0	0	0	0	28	-
scoparius	Blaze	Kansas	5	2	3	0	-	3	3	5	3	0	0	0	0	24	-
scoparius	Aldous	Kansas	6	3	5	0	-	4	4	6	3	1	0	0	0	18	-
**scoparius*	Pastura	Los Lunas PMC	6	1	2	0	2	1	2	3	2	0	0	0	0	30	-
scoparius	PMK-152	Kansas	9	2	2	0	-	4	3	5	3	0	0	0	0	30	-
Aristida																	
longiseta	M-1064	Roosevelt Co., MT	0														
longiseta	M-1100	Lake Co., MT	9	3	5	0	6	6	6	6	7	1	0	0	0	15	8-16
Arrhenatherum																	
elatius	PI-316160	Spain	9	1	1	0	1	-	1	1	1	0	0	0	0	46	-
**elatius*	Tualatin	Corvallis PMC	2	2	2	0	3	2	2	1	2	0	0	0	0	41	7-22
Beckmannia																	
syzigachne	M-621	Meagher Co., MT	0														
syzigachne	M-1043	Hill Co., MT	9	4	5	0	4	2	5	2	3	0	0	0	0	27	8-8
syzigachne	M-1087	Fergus Co., MT	0														
syzigachne	M-1119	Fallon Co., MT	0														

* Best performer.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Bothriochloa ischaemum	A-1407	USSR via LL PMC	1	1	4	0	2	1	2	7	4	0	0	0	0	36	9-1
Bouteloua curtipendula	M-644	Powder River Co., MT	0														
curtipendula	M-748	Wibaux Co., MT	0														
curtipendula	M-1060	Roosevelt Co., MT	8	3	5	6	5	4	5	7	4	0	0	0	0	25	8-11
curtipendula	M-1090	Garfield Co., MT	7	4	6	7	6	3	6	9	5	1	0	0	0	22	8-25
curtipendula	M-1114	Montana	0														
curtipendula	WY-383	Campbell Co., WY	0														
curtipendula	WY-389	Platte Co., WY	0														
curtipendula	WY-409	Platte Co., WY	0														
curtipendula	WY-446	Crook Co., WY	0														
****curtipendula**	Pierre	Bismarck PMC	1	1	1	5	2	1	1	8	1	0	0	0	0	26	8-15
gracilis	WY-568	Washakie Co., WY	4	2	3	0	4	3	3	7	3	0	0	0	0	20	8-11
gracilis	WY-575	Fremont Co., WY	5	2	2	5	4	2	3	8	3	0	0	0	0	22	8-11
***gracilis**	Lovington	Los Lunas PMC	1	1	1	6	6	1	1	1	2	0	0	0	0	24	-
Bromus aleutensis	M-791	Granite Co., MT	0														

* Best performer.

** Best performer and also standard for comparison.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Bromus																	
**anomalus*	WY-589	Park Co., WY	1	1	2	0	1	1	2	2	1	0	5	0	0	32	7-20
japonicus	M-964	Carbon Co., MT	0														
**marginatus*	WY-585	Sheridan Co., WY	1	1	2	0	3	1	1	1	1	0	0	0	0	37	7-20
marginatus	WY-593	Wyoming	3	1	2	0	3	2	1	2	3	0	0	0	0	34	7-20
marginatus	Bromar	Pullman PMC	0														
marginatus	WY-612	Teton Co., WY	2	2	2	0	3	1	2	3	2	0	0	0	0	41	-
oxydon	PI-314232	USSR	0														
scoparius	PI-314229	USSR	0														
species	M-802	Madison Co., MT	0														
species	PI-315397 11/	USSR	9	3	4	0	6	-	3	2	-	0	0	0	0	36	8-11
variegatus	PI-315395	USSR	0														
variegatus	PI-315396	USSR	0														
Calamagrostis																	
canadensis	M-1284	Alaska	9	1	5	3	3	-	3	3	3	0	0	0	0	29	-
canescens	PI-316179	Poland	0														
montanensis	M-897	Wheatland Co., MT	0														
Calamovilfa																	
longifolia	M-734	Yellowstone Co., MT	0														

* Best performer.

11/ Dense pubescence on leaves.

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Calamovilfa																	
longifolia	M-739	Teton Co., MT	0														
longifolia	M-754	Toole Co., MT	0														
longifolia	M-806	Sweet Grass Co., MT	0														
longifolia	M-835	Fallon Co., MT	0														
longifolia	WY-367	Goshen Co., WY	0														
longifolia	WY-368	Goshen Co., WY	0														
longifolia	WY-400	Park Co., WY	0														
longifolia	WY-417	Park Co., WY	9	3	5	4	6	6	5	7	4	0	0	0	0	34	-
longifolia	WY-643	Crook Co., WY	0														
****longifolia**	Goshen	Bridger PMC	2	1	1	3	2	1	2	4	3	0	0	0	0	60	-
longifolia	C-12	Colorado	9	2	4	3	3	-	4	7	4	5	0	0	0	55	-
longifolia	SD-114	Bismarck PMC	0														
Carex																	
eleocharis	M-899	Gallatin Co., MT	0														
nebraskensis	WY-662	Uinta Co., WY	0														
species	WY-592	Wyoming	0														
species	WY-595	Wyoming	0														
Catabrosa																	
aquatica	PI-314367	USSR	0														

** Best performer and also standard for comparison.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Dactylis glomerata	A-1801	Los Lunas PMC	2	1	4	0	2	1	2	1	1	0	1	0	0	40	8-11
glomerata	Latar	Pullman PMC	1	1	1	0	3	1	1	2	2	0	0	0	0	44	8-5
**glomerata*	Nordstern	Northrup King Co.	1	1	2	0	3	1	2	1	1	0	0	0	0	46	8-5
glomerata	Pomar	Aberdeen PMC	3	1	3	0	1	1	1	2	3	0	2	0	0	31	8-11
Deschampsia caespitosa	M-1066	Roosevelt Co., MT	9	2	5	0	5	-	4	7	4	0	0	0	5 12/	24	-
Distichlis stricta	M-996	Stillwater Co., MT	0														
Echinochloa crusgalli	M-163	Richland Co., MT	0														
crusgalli	M-1277	California	0														
crusgalli	PI-173754	Turkey	0														
crusgalli	PI-177389	Turkey	0														
crusgalli	PI-182304	Turkey	0														
crusgalli	PI-196291	India	0														
crusgalli	PI-197272	India	0														
crusgalli	PI-211025	Afghanistan	0														
crusgalli	PI-219606	Pakistan	0														

* Best performer.

12/ Soft shell scale insects.

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Echinochloa																	
crusgalli	PI-220518	Afghanistan	0														
crusgalli	PI-250096	Egypt	0														
crusgalli	P-14945	Nevada	0														
crusgalli	P-14946	California	0														
crusgalli	P-14948	Oregon	0														
crusgalli	M-1264	California	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
crusgalli	M-1265	South Carolina	0														
c. frumentacea	PI-217911	India	0														
c. frumentacea	PI-219608	Pakistan	0														
Elymus																	
canadensis	M-770	Roosevelt Co., MT	0														
canadensis	M-836	Broadwater Co., MT	0														
**canadensis*	M-995	Stillwater Co., MT	1	1	1	0	1	1	1	2	1	0	5	0	0	52	8-12
canadensis	M-1035	Fergus Co., MT	3	1	5	0	2	-	-	3	2	0	5	0	0	52	8-12
cinereus	M-1014	Rosebud Co., MT	7	5	5	0	5	5	4	7	3	0	0	6 3/	0	58	7-25
cinereus	M-1025	Deer Lodge Co., MT	5	6	7	0	6	4	6	7	3	0	0	8 3/	0	53	7-25
cinereus	WY-351	Sublette Co., WY	0														
cinereus	WY-424	Lincoln Co., WY	9	4	4	0	8	5	4	6	3	0	0	5 3/	0	53	7-25
cinereus	WY-479	Platte Co., WY	6	3	4	0	6	3	5	8	3	0	0	4 3/	0	58	8-25

* Best performer.

3/ Leaf & stem rust.

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Elymus																	
cinereus	P-5797	Aberdeen PMC	4	1	2	0	3	1	2	4	2	0	0	1	0	61	8-25
**cinereus*	P-15590 13/	Bridger PMC	3	1	1	0	3	1	2	6	1	0	0	1	0	66	7-25
glaucus	M-681	Granite Co., MT	0														
junceus	M-953 (L#1)	Blaine Co., MT	0														
	(L#2)		9	1	1	0	3	3	1	2	3	0	0	0	0	47	8-1
	(L#3)		9	2	2	0	5	2	1	2	3	0	0	0	0	43	8-1
	*(L#4)		2	1	2	0	2	1	1	1	2	0	0	0	0	46	8-1
junceus	M-1273	Canada	5	1	1	0	2	1	1	1	1	0	0	0	0	44	8-1
junceus	Vinall	Colorado	4	1	2	0	3	2	1	2	3	0	0	0	0	46	8-1
patagonicus	PI-297898	Argentina	0														
salinus	WY-684	Sheridan Co., WY	0														
salinus	C-28	Los Lunas PMC	0														
triticoides	M-691	Beaverhead Co., MT	0														
***triticoides*	P-15594	Bridger PMC	3	1	2	1	7	1	1	4	3	0	-	1	0	32	8-1
triticoides	C-77	Los Lunas PMC	0														
triticoides	P-2741	Pullman PMC	9	3	3	5	9	5	4	4	2	0	0	0	0	36	8-14

* Best performer.

** Best performer and also standard for comparison.

13/ Early maturity.

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Elymus																	
villosus	PI-297899	Germany	0														
Eragrostis																	
curvula	M-1272	Tucson PMC	9	9	9	0	0	9	9	4	9	9	0	0	0	18	-
superba	P-15628	Tucson PMC	0														
Festuca																	
idahoensis	M-619	Fergus Co., MT	0														
idahoensis	M-620[15]	Meagher Co., MT	8	4	8	0	4	2	6	7	3	0	0	0	5[14]	24	-
**idahoensis*	M-448[16]	Bridger PMC	5	2	5	0	2	1	2	2	2	0	0	0	0	28	-
**o. duriuscula*	M-794	Granite Co., MT	1	1	4	0	1	1	1	1	1	0	0	0	0	27	-
o. durisucula	Durar	Pullman PMC	7	1	4	0	1	1	1	1	1	0	0	0	0	30	-
ovina	P-274	Pullman PMC	0														
scabrella	M-618	Fergus Co., MT	0														
scabrella	M-623	Gallatin Co., MT	0														
scabrella	M-629	Ravalli Co., MT	0														
scabrella	M-630	Meagher Co., MT	0														
scabrella	M-631	Cascade Co., MT	0														

* Best performer.

14/ Possibly cutworms.

15/ Not tolerant of drought.

16/ Mildly tolerant of drought.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Festuca																	
scabrella	M-641	Cascade Co., MT	9	5	6	0	-	0	6	3	3	0	0	0	0	8	-
scabrella	M-647	Teton Co., MT	0														
scabrella	M-684	Meagher Co., MT	0														
scabrella	M-732	Beaverhead Co., MT	0														
scabrella	M-839	Flathead Co., MT	0														
scabrella	M-840	Sanders Co., MT	0														
scabrella	M-877	Sanders Co., MT	0														
scabrella	M-878	Sanders Co., MT	0														
scabrella	M-879	Sanders Co., MT	0														
scabrella	M-886	Flathead Co., MT	0														
scabrella	M-902	Alberta, Canada	0														
scabrella	M-954	Lake Co., MT	0														
Helictotrichon																	
hookeri	M-628	Judith Basin Co., MT	0														
Hesperochloa																	
kingii	M-168	Sweet Grass Co., MT	9	3	4	6	0	4	4	3	2	0	0	0	0	15	-
kingii	M-640	Bridger PMC	9	3	5	0	0	4	6	3	3	0	0	0	0	10	-
kingii	WY-376	Albany Co., WY	0														
kingii	WY-401	Sublette Co., WY	0														
kingii	WY-402	Park Co., WY	0														

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

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Hesperochloa																	
kingii	WY-456	Johnson Co., WY	0														
kingii	WY-484	Platte Co., WY	0														
kingii	WY-512	Converse Co., WY	9	3	6	5	0	2	6	4	3	0	0	0	0	11	-
Koeleria																	
phleoides	M-1274	France	0														
vallesiana	M-1275	France	0														
Lolium																	
perenne	Caprice	Oregon	1	1	3	0	5	5	2	1	5	0	0	0	0	21	-
perenne	Game	Oregon	3	2	4	0	3	1	3	2	3	0	0	0	0	22	-
**perenne*	Petra	Northrup King Co.	2	1	3	0	3	1	2	1	3	0	0	0	0	28	-
perenne	Taptoe	Northrup King Co.	1	1	4	0	4	1	3	3	3	0	0	0	0	27	-
perenne	Tetrablend	Northrup King Co.	2	4	5	0	4	2	4	4	5	1	0	0	0	28	-
species	Billion	Northrup King Co.	1	3	5	0	3	2	3	6	2	0	0	0	0	29	-
species	Tetrone	Northrup King Co.	1	3	5	0	3	2	4	5	1	0	0	0	0	33	-
Melica																	
spectabilis	M-793	Granite Co., MT	0														
Molina																	
caerulea	M-1276	France	0														

* Best performer.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Muhlenbergia																	
cuspidata	M-645	Powder River Co., MT	0														
cuspidata	M-728	Wibaux Co., MT	0														
cuspidata	M-820	Powder River Co., MT	0														
cuspidata	M-826	Petroleum Co., MT	0														
cuspidata	M-1052	Phillips Co., MT	0														
cuspidata	M-1070	Roosevelt Co., MT	0														
cuspidata	WY-448	Campbell Co., WY	0														
racemosa	WY-387	Albany Co., WY	0														
**wrightii*	El Vado	Los Lunas PMC	2	1	2	0	2	1	1	5	5	0	5	0	0	21	-
Oryzopsis																	
hymenoides	M-889	Stillwater Co., MT	9	4	-	-	-	-	-	-	-	-	-	0	0	6	-
hymenoides	M-903	Teton Co., MT	5	4	6	0	8	6	6	5	5	0	0	0	0	12	-
hymenoides	M-916	Sanders Co., MT	0														
hymenoides	M-921	Yellowstone Co., MT	0														
hymenoides	M-922	Wibaux Co., MT	5	3	3	0	3	2	3	4	3	0	0	0	0	24	-
hymenoides	WY-452	Crook Co., WY	0														
hymenoides	WY-504	Uinta Co., WY	5	3	-	-	-	-	-	5	-	-	-	0	0	-	-
hymenoides	WY-510	Lincoln Co., WY	0														

* Best performer.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Oryzopsis																	
hymenoides	WY-519	Lincoln Co., WY	8	3	6	0	6	5	6	6	5	0	0	0	0	16	-
hymenoides	WY-536	South Dakota	5	2	2	0	2	2	2	3	3	0	0	0	0	24	-
hymenoides	WY-601	Sweetwater Co., WY	8	3	5	0	5	3	5	4	4	0	0	0	0	21	-
****hymenoides**	P-15597	Bridger PMC	1	1	1	0	1	1	1	2	1	0	2	0	0	31	-
hymenoides	Paloma	Los Lunas PMC	4	2	2	0	2	2	2	3	2	0	0	0	0	22	-
micrantha	M-873	McCone Co., MT	3	2	6	0	4	1	5	6	3	0	0	0	0	24	-
Panicum																	
antidotale	A-16851	Tucson PMC	0	-	-	-	-	-	-	-	0	9	-	-	-	-	-
miliaceum	PI-163298	India	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-170592	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-170604	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-178991	Turkey	0														
miliaceum	PI-179389	Turkey	0														
miliaceum	PI-179392	Iraq	0														
miliaceum	PI-198154	India	0														
miliaceum	PI-202294	Argentina	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-204598	Turkey	0														
miliaceum	PI-207663	Morocco	0														

** Best performer and also standard for comparison.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Panicum																	
miliaceum	PI-220392	Afghanistan	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-222201	Afghanistan	0														
miliaceum	PI-223275	Afghanistan	0														
miliaceum	PI-223391	Iran	0														
miliaceum	PI-227245	Iran	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-232929	Hungary	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-251389	Iran	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-253789	Iraq	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-253790	Iraq	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	PI-269953	West Pakistan	0														
miliaceum	PI-269957	West Pakistan	0														
miliaceum	PI-269958	West Pakistan	0														
miliaceum	PI-296376	Canada	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	P-14992	India	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	P-14993	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	P-14994	Georgia	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	P-14995	Georgia	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	A-600	North Dakota	0														
miliaceum	A-601	North Dakota	0														
miliaceum	A-602	North Dakota	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Panicum																	
miliaceum	A-606	Missouri	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	A-607	Missouri	0														
miliaceum	A-608	Missouri	0														
miliaceum	M-1266	Hungary	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	M-1267	Hungary	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
miliaceum	M-1268	Hungary	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
stapfianum	A-14156	Tucson PMC	0	-	-	-	-	-	-	-	0	9	-	-	-	-	-
virgatum	M-1009	McCone Co., MT	0														
virgatum	M-1072	McCone Co., MT	0														
virgatum	P-15599	Bridger PMC	0														
virgatum	C-10	Colorado	8	1	3	5	5	5	3	3	3	0	0	0	0	44	-
**virgatum*	SD-149	South Dakota	1	1	1	4	4	2	1	7	1	0	0	0	0	42	-
Pennisetum																	
ciliare	P-15580	Hawaii	0														
glaucum	Millex 22	Northrup King Co.	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
spicatum	PI-214330	India	0														
spicatum	PI-215602	India	0														
spicatum	PI-218098	Pakistan	0														

* Best performer.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Pennisetum																	
spicatum	PI-218099	Pakistan	0														
spicatum	PI-218100	Pakistan	0														
spicatum	PI-219820	Rhodesia	0														
Phalaris																	
arundinacea	WY-594	Wyoming	0														
arundinacea	P-15601	Bridger PMC	9	2	2	5	4	2	2	1	1	0	0	0	0	51	-
**arundinacea*	M-1269	Corvallis PMC	1	1	1	4	4	1	1	2	1	0	0	0	0	48	-
arundinacea	M-1270	Corvallis PMC	5	1	2	4	4	2	2	2	1	0	0	0	0	48	-
arundinacea	M-1271	Corvallis PMC	8	1	1	4	3	4	2	2	1	0	0	0	0	52	-
arundinacea	MI-4694-60	Missouri	0														
arundaincea	Castor	Canada	6	1	1	4	3	1	1	1	2	0	0	0	0	50	-
t. stenoptera	P-15621	Corvallis PMC	9	4	7	0	8	4	8	5	8	8 17/	0	0	0	36	-
Poa																	
ampla	M-639	Garfield Co., MT	0														
ampla	M-768	Missoula Co., MT	9	1	1	0	2	1	2	2	1	0	0	0	0	32	-
**ampla*	M-841	Missoula Co., MT	6	2	2	0	2	1	2	1	1	0	0	0	0	28	-
ampla	P-846	Montana State Univ.	0														
ampla	P-5731	Washington	0														

* Best performer.

17/ Lacks winter hardiness.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Poa																	
ampla	P-13827	Pullman PMC	0														
ampla	Sherman	Pullman PMC	9	2	3	0	3	2	3	3	2	0	0	0 3/	0	31	-
arida	M-991	Carbon Co., MT	4	2	3	3	3	1	3	3	2	0	0	8 3/	0	30	-
arida	M-1037	Fergus Co., MT	7	3	4	5	3	4	3	4	3	0	2	6 3/	0	28	-
arida	M-1071	Richland Co., MT	4	1	2	3	3	2	3	3	3	0	0	2 3/	0	29	-
arida	WY-573	Fremont Co., WY	5	1	4	4	3	1	3	3	1	0	1	1	0	29	-
arida	WY-579	Park Co., WY	9	3	5	4	5	6	5	4	3	0	0	2 3/	0	30	-
**arida*	NM-625	Los Lunas PMC	6	1	1	1	2	1	1	1	3	0	0	0	0	35	-
glaucifolia	Draylar	Pullman PMC	0														
glaucifolia	M-634	Broadwater Co., MT	0														
glaucifolia	M-1049	Phillips Co., MT	0														
glaucifolia	M-1051	Phillips Co., MT	9	1	2	2	3	-	2	2	3	0	0	1	0	29	-
glaucifolia	M-1068	Sheridan Co., MT	0														
glaucifolia	M-1069	Sheridan Co., MT	0														
juncifolia	WY-388	Albany Co., WY	0														
nevadensis	M-1	Bridger PMC	9	4	6	0	6	6	5	4	3	0	0	0	4 18/	30	-

* Best performer.

3/ Leaf & stem rust.

18/ Insect identity unknown.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Poa																	
**pratensis*	M-927 19/	Pondera Co., MT	5	1	2	2	2	1	2	3	2	0	0	1	0	29	-
pratensis	P-142 20/	Oregon	6	1	2	1	4	4	1	4	3	0	8	1	0	23	-
pratensis	Troy	Bridger PMC	6	2	4	3	3	1	4	1	3	0	0	0 5/	0 18/	32	-
species	M-1055	Valley Co., MT	9	6	7	6	7	4	7	6	3	0	0	3 5/	3 18/	27	-
Puccinellia																	
airoides	M-41	Bridger PMC	9	5	6	0	5	5	6	4	1	0	0	0	5 18/	25	8-1
airoides	M-635	Broadwater Co., MT	0														
airoides	M-648	Granite Co., MT	9	3	6	0	4	3	4	3	1	0	2	0	3 18/	22	8-1
airoides	M-676	Prairie Co., MT	0														
airoides	M-692	Teton Co., MT	7	2	3	0	2	2	2	3	1	0	1	0	0 18/	27	8-1
airoides	M-697	Toole Co., MT	9	3	5	0	5	5	5	3	4	0	1	0	2 18/	22	8-1
airoides	M-740	Flathead Co., MT	8	8	7	0	7	3	7	6	3	0	8	0	9 18/	24	8-1
**airoides*	M-990	Carbon Co., MT	7	2	3	0	3	2	2	6	1	0	7	0	3 18/	22	8-1

* Best performer.

18/ Insect identity unknown.

19/ Shortest with dense foliage.

20/ Tallest with medium foliage.

5/ Leaf & stem rust.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Puccinellia																	
airoides	M-997	Stillwater Co., MT	7 21/	3	6	0	5	6	6	3	-	-	1	0	0	24	8-1
airoides	M-1038	Fergus Co., MT	7 21/	3	6	0	5	5	5	4	-	-	0	0	0	24	8-1
airoides	WY-429	Sweetwater Co., WY	9	6	7	0	6	-	7	5	3	0	0	0	7 18/	17	8-1
airoides	WY-453	Crook Co., WY	9	5	7	0	7	3	8	4	5	0	0	0	5 18/	19	8-1
airoides	WY-564	Park Co., WY	9	6	5	0	5	3	5	5	3	0	0	0	8 18/	23	8-1
airoides	WY-572	Fremont Co., WY	7	4	4	0	3	3	3	7	1	0	5	0	6 18/	26	8-1
airoides	WY-580	Park Co., WY	0														
airoides	M-1161	Colorado	0	-	-	-	-	-	-	-	3	0	-	-	9 22/	-	-
distans	M-1159	Colorado	0														
species	M-1018	Beaverhead Co., MT	0														
species	PI-220623	Afghanistan	0														
Scirpus																	
species	M-1040	Chouteau Co., MT	0														
species	M-1086	Carbon Co., MT	0														
Secale																	
montanum	PI-330721	Iran	0														

18/ Insect identity unknown.
21/ Stand established 1977.
22/ Unknown insect killed plant.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Late
Sesleria heufleriana	PI-314105	USSR	0														
Setaria glauca	PI-204629	Turkey	0														
glauca	PI-206747	Turkey	0														
italica	PI-177543	Turkey	0														
italica	PI-179492	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
italica	PI-180304	India	0														
italica	PI-182260	Turkey	0														
italica	PI-195752	China	0														
italica	PI-195753	China	0														
italica	PI-196293	India	0														
italica	PI-207502	Afghanistan	0														
italica	PI-219618	Pakistan	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
italica	PI-219619	Pakistan	0														
italica	PI-220545	Afghanistan	0														
italica	PI-230136	Iran	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
italica	PI-250391	Pakistan	0														
italica	PI-253494	India	0														
italica	PI-253495	Afghanistan	0														
italica	PI-269967	West Pakistan	0														

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Setaria																	
italica	PI-269969	West Pakistan	0														
italica	PI-269971	West Pakistan	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
italica	PI-290458	Pullman PMC	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
italica	PI-296378	Canada	0														
italica	P-14981	California PMC	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
italica	M-1262	Missouri	0														
italica	M-1263	Missouri	0														
lutescens	P-14983	California	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
lutescens	PI-223293	Afghanistan	0														
lutescens	PI-223294	Afghanistan	0														
verticillata	PI-204626	Turkey	0														
verticillata	PI-204627	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
verticillata	PI-206748	Turkey	0														
viridis	PI-204624	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
viridis	PI-204625	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
viridis	PI-204727	Turkey	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
viridis	PI-212625	Turkey	0														
viridis	PI-212626	Afghanistan	0														
viridis	PI-221960	Afghanistan	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-
viridis	PI-223677	Iran	0														
viridis	P-14982	California PMC	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Sitanion hystrix	M-988	Carbon Co., MT	9	8	8	0	7	2	6	3	4	0	0	0	0	9	8-1
Spartina gracilis	M-674	Prairie Co., MT	0														
gracilis	M-762	Wibaux Co., MT	0														
gracilis	M-938	Madison Co., MT	0														
gracilis	M-1023	Deer Lodge Co., MT	0														
gracilis	M-1036	Fergus Co., MT	0														
gracilis	M-1039	Chouteau Co., MT	0														
gracilis	WY-566	Washakie Co., WY	0														
gracilis	WY-570	Fremont Co., WY	0														
gracilis	WY-638	Johnson Co., WY	0														
gracilis	M-1167	Golden Valley Co., MT	0														
pectinata	M-1031	Carbon Co., MT	0														
pectinata	M-1056	Valley Co., MT	0														
Sporobolus airoides	M-21	Bridger PMC	5	1	2	0	3	2	2	4	4	0	0	0	0	30	8-10
airoides	M-636	Broadwater Co., MT	9[21/]	3	5	0	5	4	5	4	-	-	0	0	0	25	8-5
airoides	M-727	Teton Co., MT	0														

21/ Stand established 1977.

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Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Sporobolus																	
airoides	M-729	Big Horn Co., MT	8	3	3	0	5	5	4	4	4	0	0	0	0	29	8-16
airoides	M-809	Powder River Co., MT	9 21/	3	4	0	6	4	5	6	-	-	0	0	0	21	8-5
airoides	M-810	Petroleum Co., MT	0														
airoides	M-992	Carbon Co., MT	0														
airoides	M-1017	Carbon Co., MT	0														
airoides	M-1118	Custer Co., MT	0														
airoides	WY-415	Sweetwater Co., WY	9 21/	3	6	0	8	3	6	5	-	-	0	0	0	20	8-5
airoides	WY-450	Campbell Co., WY	0														
airoides	WY-451	Crook Co., WY	0														
airoides	WY-467	Washakie Co., WY	8	3	4	0	5	3	4	5	4	0	0	0	0	22	8-16
airoides	WY-472	Hot Springs Co., WY	9	3	4	0	5	3	4	5	4	0	0	0	0	26	8-16
airoides	WY-571	Fremont Co., WY	6	2	3	0	5	4	3	3	4	0	0	0	0	32	8-11
airoides	WY-577	Fremont Co., WY	6	2	3	0	5	3	3	3	4	0	0	0	0	30	8-9
airoides	WY-581	Natrona Co., WY	6	2	3	0	4	3	3	3	4	0	0	0	0	34	8-10
airoides	WY-604	Johnson Co., WY	0														
airoides	A-14711	Tucson PMC	9	2	3	0	6	3	3	1	5	0	0	0	0	35	8-16
airoides	ND-264	North Dakota	0														

21/ Stand established 1977.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Sporobolus																	
airoides	NM-184	Los Lunas PMC	9	1	31	0	3	3	2	1	5	0	0	0	0	36	8-9
**airoides*	PMT-1733	Sayer, Oklahoma	4	1	1	0	1	3	1	2	3	0	0	0	0	36	8-16
asper	WY-411	Goshen Co., WY	0														
**contractus*	A-14544	Tucson PMC	3	1	2	0	2	2	2	2	7	3	0	0	0	46	8-16
cryptandrus	M-1012	Powder River Co., MT	9[21/]	3	6	0	5	4	6	9	-	-	0	0	0	25	8-19
cryptandrus	WY-468	Big Horn Co., WY	0														
cryptandrus	A-16352	Tucson PMC	6	1	4	0	2	1	2	3	6	0	0	0	0	40	8-16
usitatus	P-15641	Tucson PMC	9	6	7	0	0	-	6	4	9	9	0	0	0	15	-
Stipa																	
**columbiana*	M-682	Granite Co., MT	3	2	3	0	4	2	2	3	2	0	0	1	0	46	8-1
columbiana	M-687	Silver Bow Co., MT	7	3	4	0	4	2	3	4	3	0	0	1	0	36	8-1
columbiana	M-743	Sanders Co., MT	0														
columbiana	M-812	Madison Co., MT	0														
columbiana	M-813	Lincoln Co., MT	0														
columbiana	WY-584	Sheridan Co., WY	7[21/]	2	-	-	-	-	-	6	-	-	-	1	0	-	-
comata	M-617	Prairie Co., MT	0														
comata	M-994	Stillwater Co., MT	8	2	4	0	5	2	4	3	2	0	0	1	0	37	-
comata	M-1047	Phillips Co., MT	9	2	4	0	3	2	3	5	2	0	0	1	0	30	-

[21/] Stand established 1977.
* Best performer.

TABLE 2. Project I. Initial Evaluation Plantings. Performance of grasses for reclamation of mined lands. Planted November 1975 and May 1976 in Field 2 - Bridger PMC.

Species	Accessions	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Disease Injury	Insect Injury	Height (inches)	Maturity Date
Stipa																	
comata	WY-371	Converse Co., WY	0														
formicarum	P-15629	Tucson PMC	7	5	6	0	6	7	6	2	6	5	0	0	3	30	-
scribneri	NM-104	Los Lunas PMC	9	4	4	0	8	4	5	3	5	0	0	1	0	20	8-4
viridula	M-808	Custer Co., MT	0														
viridula	M-904	Gallatin Co., MT	2	2	3	0	4	1	3	2	3	0	0	1	0	36	-
viridula	WY-464	Hot Springs Co., WY	8	2	3	0	4	4	3	3	4	0	1	1	0	36	-
viridula	WY-465	Washakie Co., WY	5	2	2	0	3	2	3	3	3	0	0	1	0	37	-
viridula	WY-466	Hot Springs Co., WY	6	1	2	0	2	2	2	3	3	0	0	1	0	38	-
viridula	WY-475	Park Co., WY	6	2	3	0	5	2	3	2	4	0	0	1	0	40	-
viridula	WY-483	Platte Co., WY	5	2	3	0	3	1	2	3	4	0	0	0	0	46	-
**viridula*	P-15604	Bridger PMC	1	1	1	0	1	1	1	1	1	0	0	2 3/	0	45	-
viridula	Lodorm	Bismarck PMC	1	1	1	0	1	1	1	1	2	0	0	2 3/	0	38	-
Tripsacum																	
dactyloides	PMK-24	Kansas PMC	7	2	3	0	0	3	4	6	2	0	0	0	0	18	-

* Best performer.

3/ Leaf & stem rust.

TABLE 3. Project I. Initial Evaluation Plantings. Botanical and common names of entries that exhibited promise 1977. Planted for mined land reclamation in Field 2 - Bridger PMC.

Accession or Variety	Species	Common Name
M-1042	*Agropyron albicans*	Montana wheatgrass
WY-462	*Agropyron cristatum*	crested wheatgrass
Critana	*Agropyron dasystachyum*	thickspike wheatgrass
Nordan	*Agropyron desertorum*	standard crested wheatgrass
Alkar	*Agropyron elongatum*	tall wheatgrass
Whitmar	*Agropyron inerme*	beardless wheatgrass
Greenar	*Agropyron intermedium*	intermediate wheatgrass
Oahe	*Agropyron intermedium*	intermediate wheatgrass
PI-281863	*Agropyron junceum*	rushleaf quackgrass
M-1044	*Agropyron pseudorepens*	false quackgrass
M-1117	*Agropyron repens*	quackgrass
Sodar	*Agropyron riparium*	streambank wheatgrass
P-27	*Agropyron sibiricum*	Siberian wheatgrass
M-1057	*Agropyron smithii*	western wheatgrass
Barton	*Agropyron smithii*	western wheatgrass
Rosana	*Agropyron smithii*	western wheatgrass
P-15649	*Agropyron spicatum*	bluebunch wheatgrass
M-1030	*Agropyron trachycaulum*	slender wheatgrass
Luna	*Agropyron trichophorum*	pubescent wheatgrass
Mandan-759	*Agropyron trichophorum*	pubescent wheatgrass
P-5903	*Alopecurus pratensis*	meadow foxtail
NDG-4	*Andropogon gerardii*	big bluestem
M-241	*Andropogon hallii*	sand bluestem
A-14207	*Andropogon ischaemum*	yellow bluestem
A-1407	*Bothriochloa ischaemum*	yellow bluestem
Pastura	*Andropogon scoparius*	little bluestem
Tualatin	*Arrhenatherum elatius*	tall oatgrass
Pierre	*Bouteloua curtipendula*	sideoats grama
Lovington	*Bouteloua gracilis*	blue grama
WY-589	*Bromus anomalus*	nodding brome
WY-585	*Bromus marginatus*	mountain brome
Goshen	*Calamovilfa longifolia*	prairie sandreed
Nordstern	*Dactylis glomerata*	orchardgrass
M-995	*Elymus canadensis*	Canada wildrye
P-15590	*Elymus cinereus*	basin wildrye
M-953,L#4	*Elymus junceus*	Russian wildrye
P-15594	*Elymus triticoides*	beardless wildrye
M-448	*Festuca idahoensis*	Idaho fescue
M-794	*Festuca ovina duriuscula*	hard fescue
Petra	*Lolium perenne*	perennial ryegrass

TABLE 3. Project I. Initial Evaluation Plantings. Botanical and common names of entries that exhibited promise 1977. Planted for mined land reclamation in Field 2 - Bridger PMC. Continued.

Accession or Variety	Species	Common Name
El Vado	*Muhlenbergia wrightii*	spike muhly
P-15597	*Oryzopsis hymenoides*	Indian ricegrass
SD-149	*Panicum virgatum*	switchgrass
M-1269	*Phalaris arundinacea*	reed canarygrass
M-841	*Poa ampla*	big bluegrass
NM-625	*Poa arida*	plains bluegrass
M-927	*Poa pratensis*	Kentucky bluegrass
M-990	*Puccinellia airoides*	Nuttall alkaligrass
PMT-1733	*Sporobolus airoides*	alkali sacaton
A-14544	*Sporobolus contractus*	spike dropseed
M-682	*Stipa columbiana*	columbia needlegrass
P-15604	*Stipa viridula*	green needlegrass

Initial Evaluation of Legumes for Reclamation of Mined Lands

One hundred sixteen accessions of 49 legume species are being evaluated primarily for reclamation of mined land. They are also being considered for other forage-producing and soil-stabilizing uses. Plant performance is being evaluated on seedling vigor, stand establishment, ground cover, plant uniformity, winter hardiness, forage production, seed production, and ability to spread from roots. This initial evaluation work is funded by SEAM and EPA.

Methods and Materials

One hundred fifteen accessions were seeded May 18, 1976, and one on March 18, 1977, in Field 2 at the Bridger Plant Materials Center. A standard for comparison, where available, was planted for each genus. Each accession was seeded in a 16-foot row, with the rows spaced 3 feet apart.

The eastern edge of Field 2 is a Haverson silty clay loam. The control section (10"-40") contains approximately 30% clay. The remainder of the field is a Lohler silty clay loam. The control section is a sandy clay. The surface material is 5"-30" of clay or sandy clay.

The planting was cultivated April 13, September 2, and October 12. It was hand weeded on August 12, 1977. The field was irrigated June 19, August 27, and September 27.

The *Medicago*, *Melilotus*, and *Onobrychis* species were cut to a 3-inch stubble height July 12, 1977. All of the other legumes were cut August 23, 1977, to a 3-inch stubble height, except the *Lespedeza*, which had not yet headed. The *Medicago* and *Onobrychis* numbers were cut a second time on this date. The first flower appeared on the *Lespedeza* number October 4, 1977, followed by a 26°F frost October 6, 1977.

Plant performance and origin is recorded on table 4 with the best entries marked. Common names are listed on table 5.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977.

Species	Accession	Origin	Stand[1]	Vigor[1]	Forage Production[1]	Ability to Spread[1]	Seed Production[1]	Uniformity[1]	Ground Cover[1]	Cutting Recovery[1]	Spring Recovery[1]	Winter Injury[1]	Lodging[1]	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic[2]	Flower Color
Astragalus																			
bisulcatus	M-934	Carbon Co., MT	6	1	2	0	1	1	2	3	2	0	6	30	5-25	7-17	5-19	2	purple
**cicer*	Lutana	Bridger PMC	1	1	1	3	2	1	1	2	2	0	0	48	6-13	9-5	6-1	2	yellow
**crassicarpus*	M-1029	Bridger PMC	5	1	4	0	2	2	3	6	4	0	7	12	5-16	7-16	5-5	2	blue
crassicarpus	M-1085	Gallatin Co., MT	9	5	6	0	0	2	6	7	6	0	0	8	-	-	0	2	-
**galegiformis*	M-955	Montana State Univ.	3	1	2	0	1	1	2	4	2	0	0	42	5-27	7-16	5-20	1	yellow
glycyphyllos	PI-319817	Norway	4[3]	2	4	0	8	2	3	5	7	3	4	14	7-6	8-25	6-24	2	yellow
species	WY-617	Casper, WY	0																
species	WY-674	Natrona Co., WY	4	1	3	0	2	2	3	1	2	0	0	15	5-27	7-15	5-18	1	white
species	M-943	Alaska	7[3]	5	6	0	0	5	5	6	5	0	0	4	-	-	0	1	-
species	M-1063	Roosevelt Co., MT	5[3]	2	6	0	0	3	6	8	4	0	5	18	-	-	0	1	-
species	M-1065	Roosevelt Co., MT	9[3]	1	5	0	4	3	4	6	4	0	7	14	6-15	7-25	6-6	2	purple
species	M-1077	Musselshell Co., MT	5[3]	2	5	0	3	3	5	3	3	0	0	8	5-16	7-16	5-6	1	white
species	M-1079	Gallatin Co., MT	6[3]	1	6	0	0	3	-	6	6	0	0	7	-	-	0	1	-
species	M-1082	Chouteau Co., MT	9[3]	3	6	0	9	5	5	8	5	0	0	7	7-5	8-1	6-27	1	white
species	M-1121	Fallon Co., MT	9[3]	4	8	0	8	-	7	5	5	0	0	6	6-2	7-15	-	1	white
*species	PI-150557	Kansu, China	1	1	1	0	4	1	1[4]	5	1	0	9	7	8-20	-	-	3	purple

* Best performer.

1/ Ratings 1 - 9 with 1 = excellent, 0 = none.

2/ Ratings: 1 = upright, 2 = decumbent, 3 = spreading.

3/ Added emergence 1977.

4/ Exceptional ground cover.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977. Continued.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Crotalaria juncea	P-15576	Hawaii	0																
Desmodium intortum	P-15577	Hawaii	0																
Glycyrrhiza																			
**lepidota*	M-1075	Garfield Co., MT	2	1	2	2	8	1	3	9	2	0	2	36	6-15	8-11	-	1	white
Hedysarum																			
boreale	M-638	Granite Co., MT	9	5	8	0	0	3	8	8	6	0	0	4	-	-	0	1	-
boreale	WY-520	Teton Co., WY	4 3/	2	2	0	5	3	3	4	4	0	7	19	6-29	7-31	5-19	1	purple
**boreale*	NDL-28	Granite Co., MT	3	1	1	0	7	4	2	4	3	0	2	20	6-24	7-27	5-19	1	purple
species	M-1078	Musselshell Co., MT	7 3/	4	4	0	8	3	4	5	4	0	2	15	6-29	7-31	5-19	2	purple
species	M-1080	Gallatin Co., MT	8 3/	3	4	0	9	3	5	5	4	0	4	10	6-29	7-31	5-19	2	purple
Lathyrus odoratus	PI-308027	Czechoslovakia	0																
Lespedeza capitata	K-1655	Manhattan PMC	1	1	4	0	0	3	5	-	1	0	0	19	0	0	7-6	1	whitish yellow
Lupinus albicaulis	P-15659	Corvallis PMC	0 3/	-	-	-	-	-	-	-	0	9							
argenteus	WY-659	Uinta Co., WY	9 3/	3	7	-	-	-	-	0	-	-	-	5	-	-	0	1	-

* Best performer.

3/ Added emergence 1977.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Lupinus																			
species	M-986	Meagher Co., MT	0																
species	M-1000	Carbon Co., MT	5 3/	1	3	0	3	5	3	3	1	0	5	21	6-14	7-18	5-19	1	blue
species	M-1089	Gallatin Co., MT	6 3/	1	2	0	2	3	3	4	2	0	3	28	6-14	7-18	5-19	1	blue
species	M-1093	Gallatin Co., MT	7 3/	3	5	0	6	5	6	7	3	0	1	20	6-20	7-22	5-26	1	blue
species	WY-563	Johnson Co., WY	9 3/	6	8	0	0	3	9	9	4	0	0	4	-	-	0	1	-
species	WY-600	Sweetwater Co., WY	0																
*species	WY-675	Natrona Co., WY	5	1	1	0	1	2	2	3	2	0	3	24	6-14	7-18	5-15	1	blue
Medicago																			
coerulea	PI-283640	USSR	1	1	2	0	1	1	1	7	4	0	0	36	7-6	7-26	-	1	purple
falcata	P-13333	Pullman PMC	1	1	4	0	3	2	3	5	6	2	6	26	6-29	7-29	-	2	yellow
**falcata*	Travois	South Dakota	1	1	2	0	2	2	2	3	2	0	0	36	6-24	7-26	-	2	purple
sativa	PI-314384	USSR	4	1	2	0	3	2	2	2	2	0	0	40	6-24	7-26	-	1	purple
sativa	Ladak 65	Mont. Agr. Exp. Sta.	1	1	3	0	4	2	2	2	1	0	0	38	6-26	7-26	-	1	purple
sativa	Vernal	Northrup King Co.	1	1	3	0	4	2	2	2	3	0	0	40	6-26	7-26	-	1	purple
sativa	Drylander	Saskatchewan, Canada	1	1	1	0	2	1	1	3	2	0	0	38	6-29	7-26	-	1	yellow
**sativa*	DePuits	Beltsville PMC	1	1	1	0	2	1	1	1	2	0	0	40	6-29	7-26	-	1	purple
sativa	Grimm	Northrup King Co.	1	1	1	0	2	1	1	2	3	0	0	40	6-27	7-26	-	1	purple
sativa	Norseman	Fairfield, MT	1	1	2	0	3	1	2	3	1	0	0	40	6-28	7-26	-	1	purple

* Best performer.

3/ Added emergence 1977.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977. Continued.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Medicago																			
**tianschanica*	PI-283660	USSR	1	1	2	0	1	1	2	4	3	0	0	36	6-24	7-26	-	1	purple
Melilotus																			
alba	PI-372725	Nenana, Alaska	1	2	3	0	2	1	2	0	3	1	0	36	6-23	7-20	-	1	white
alba annua	PI-101438	Uraguay	0	-	-	-	-	-	-	-	0								
alba annua	PI-308066	Czechoslovakia	0	-	-	-	-	-	-	-	0								
**alba desri*	PI-308065	Czechoslovakia	1	1	1	0	1	1	1	0	4	0	0	52	6-30	7-20	-	1	white
Onobrychis																			
viciaefolia	M-915	Madison Co., MT	2	3	3	0	6	3	3	4	3	0	0	24	6-20	7-7	-	1	pink
viciaefolia	M-1250	Northrup King Co.	4	3	4	0	5	6	5	4	6	0	0	20	6-23	7-5	-	1	pink
viciaefolia	M-1251	Northrup King Co.	5	3	5	0	5	6	5	3	5	0	0	21	6-23	7-5	-	1	pink
viciaefolia	M-1252	Mont. State Univ.	2	2	3	0	3	4	3	2	2	0	0	34	6-23	7-7	-	1	pink
**viciaefolia*	M-1253	Mont. State Univ.	1	1	1	0	2	1	1	1	1	0	0	36	6-22	7-7	-	1	pink
viciaefolia	M-1254	Mont. State Univ.	1	2	1	0	3	1	1	3	3	0	0	38	6-23	7-10	-	1	white
viciaefolia	M-1255	Mont. State Univ.	3	2	2	0	3	3	2	3	3	0	0	38	6-23	7-10	-	1	pink
viciaefolia	M-1256	Mont. State Univ.	1	2	3	0	3	3	3	3	3	0	0	28	6-23	7-7	-	1	pink
viciaefolia	M-1257	Northrup King Co.	2	3	5	0	5	6	5	4	4	0	0	24	6-23	7-7	-	1	pink
viciaefolia	M-1258	Mont. State Univ.	1	2	4	0	5	4	4	4	3	0	0	25	6-20	7-5	-	1	pink
viciaefolia	M-1259	Mont. State Univ.	1	2	3	0	7	2	3	3	2	0	0	35	6-23	7-14	-	1	pink
viciaefolia	M-1260	Mont. State Univ.	6	3	5	0	5	6	5	4	5	0	0	24	6-17	7-7	-	1	pink

* Best performer.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977. Continued.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Onobrychis																			
viciaefolia	WY-487	Park Co., WY	7	3	5	0	6	4	5	5	4	0	0	23	6-17	7-7	-	1	pink
viciaefolia	PI-110397	Armenia	3	1	2	0	3	3	2	3	2	0	0	41	6-24	7-10	-	1	pink
viciaefolia	PI-258772	Russia	2	1	2	0	2	2	2	1	3	0	0	42	6-27	7-10	-	1	pink
viciaefolia	PI-234823	Switzerland	9	7	8	0	7	3	8	6	7	0	0	15	6-24	7-7	-	1	pink
viciaefolia	PI-205202	Turkey	6	2	3	0	2	2	2	2	3	0	0	40	6-27	7-10	-	1	pink
**viciaefolia*	Remont	Mont. Agr. Exp. Sta.	1	1	1	0	3	2	1	1	1	0	0	40	6-24	7-8	-	1	pink
Oxytropis																			
besseyi	WY-525	Fremont Co., WY	9 3/	3	6	-	-	-	-	0	-	-	-	-	-	-	0	1	-
**riparia*	M-425	Belgrade, MT	4	1	2	0	2	1	1	8	2	0	0	5	7-14	8-26	7-8	3	blue
riparia	M-890	Silverbow Co., MT	5	1	2	0	5	1	1	9	4	0	0	5	7-10	8-15	7-8	3	blue
riparia	M-935	Madison Co., MT	2	1	2	0	4	1	1	9	2	0	0	5	7-15	8-23	7-8	3	blue
riparia	M-936	Madison Co., MT	5	2	3	0	5	1	3	8	3	0	0	5	7-10	8-15	7-8	3	blue
riparia	M-937	Madison Co., MT	6	1	2	0	5	1	1	9	3	0	0	5	7-11	8-15	7-8	3	blue
Petalostemon																			
candidum	M-626	Fallon Co., MT	5	2	4	0	3	4	4	6	4	0	0	15	6-30	8-15	-	2	white
**candidum*	NDL-56	Bismarck PMC	5	1	2	0	2	2	2	6	2	0	0	18	7-3	8-19	-	1	white
purpureum	M-627	Fallon Co., MT	8	5	6	0	7	2	6	7	5	0	0	12	7-22	8-24	-	3	purple
purpureum	M-1034	Fergus Co., MT	9	5	7	0	6	6	7	0	6	6	0	10	7-21	8-19	7-8	1	purple
purpureum	M-1059	Roosevelt Co., MT	8	2	4	0	3	2	4	5	3	0	0	14	7-4	8-12	-	1	purple

* Best performer.

3/ Added emergence 1977.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977. Continued.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Petalostemon																			
purpureum	M-1067 5/	Sheridan Co., MT	6	2	3	0	3	2	3	5	3	0	0	15	7-6	8-15	-	1	purple
purpureum	M-1147 5/	Chouteau Co., MT	9	3	4	0	3	4	4	6	5	5	0	20	7-11	8-12	-	2	white
purpureum	NDL-54	Bismarck PMC	4	1	2	0	5	3	2	4	3	0	0	24	7-28	8-30	7-8	1	purple
**purpureum*	Kaneb	Riley Co., KA	2	1	2	0	3	1	2	3	2	0	0	23	7-29	9-7	7-10	1	purple
species	WY-582 6/	Sheridan Co., WY	6	1	2	0	2	1	2	9	1	0	0	16	7-9	8-15	-	1	white
Psoralea																			
esculenta	M-1001	Wibaux Co., MT	9 3/	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
species	WY-607	Casper, WY	2 3/	1	4	0	7	5	5	9	4	5	0	12	8-10	9-15	7-11	1	-
tenuiflora	M-1076	Petroleum Co., MT	4 3/	2	4	0	7	4	5	9	1	0	0	14	7-15	8-29	-	1	purple
Swainsona																			
**salsula*	M-951	Jefferson Co., MT	6	1	4	1	3	3	3	3	2	0	0	38	7-11	8-26	-	1	red/wht
salsula	WY-569	Hot Springs Co., WY	9	3	5	3	7	5	5	5	5	0	0	27	7-11	8-23	-	1	red/wht
salsula	WY-576	Fremont Co., WY	8	3	3	3	9	5	5	5	6	0	0	24	7-11	8-26	-	1	red/wht
Thermopsis																			
species	WY-704	Carbon Co., WY	9 3/	3	5	0	-	5	6	0	5	2	0	6	-	-	0	1	-

* Best performer.

3/ Added emergence 1977.

5/ Is *P. candidum*.

6/ Plants appear to be *P. candidum*.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977. Continued.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Trifolium																			
fragiferum	Salina	Montana State Univ.	0	-	-	-	-	-	-	-	0	9							
**hybridum*	PI-372758	College, Alaska	1	1	1	0	1	1	1	4	2	0	5	18	6-24	7-16	-	2	red/wht
**lupinaster*	M-1156 7/	North Dakota	5	2	5	0	4	2	5	0	3	0	0	20	7-11	8-15	-	1	purple
lupinaster	PI-297380 7/	Norway	9	3	4	0	3	2	4	0	2	0	0	16	7-3	7-27	-	1	purple
medium	PI-285047	New Zealand	6	1	3	3	3	1	1	9	4	0	0	14	7-3	7-20	-	3	purple
**pratense*	M-1157	North Dakota	1	1	1	0	1	1	1	6	3	1	4	28	7-4	7-28	-	1	purple
pratense	Kenland	Montana State Univ.	1	1	2	0	2	1	1	6	4	3	1	23	7-1	7-24	-	1	purple
species	PI-253200	Yugoslavia	1	2	4	7	8	2	3	9	4	0	0	12	7-2	7-20	-	1	pink
species	PI-314123	USSR	4 3/	4	5	0	4	5	5	9	5	1	0	14	7-10	8-4	-	1	purple
Vicia																			
americana	NDL-62	Bottineau, ND	6	2	4	2	5	3	4	7	3	0	4	16	6-14	7-15	-	1	purple
americana	WY-560 8/	Carbon Co., WY	9	3	-	-	-	-	-	-	-	-	-	4	-	-	-	1	-
amurensis	PI-308020	Czechoslovakia	8	1	3	0	4	2	3	9	3	0	6	45	8-19	9-20	7-12	3	blue
amurensis	PI-308094	Czechoslovakia	8	1	3	0	8	1	3	9	3	0	6	36	8-15	9-10	7-12	3	blue

* Best performer.
3/ Added emergence 1977.
7/ Nice ornamental.
8/ Planted 3/18/77.

TABLE 4. Project I. Initial Evaluation Plantings. Plant performance of 116 legume accessions evaluated in Field 2 at the Bridger PMC for revegetating mined lands, 1977. Continued.

Species	Accession	Origin	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Cutting Recovery	Spring Recovery	Winter Injury	Lodging	Height (inches)	Bloom Date	Maturity Date	Heading Date	Characteristic	Flower Color
Vicia																			
**cracca*	PI-314350	USSR	1	1	1	3	3	1	1	4	2	0	6	46	7-5	8-15	-	3	purple
cracca	BN-18718-67	USSR	4	2	5	1	0	2	5	5	2	1	0	14	-	-	0	3	-
pannonica	M-1155	Oregon State Univ.	0	-	-	-	-	-	-	-	0	9	-						
pannonica	M-1249	Oregon State Univ.	0	-	-	-	-	-	-	-	0	9	-						
pisiformis	PI-286214	Czechoslovakia	9	2	3	4	8	2	3	6	5	5	5	25	7-18	8-19	7-12	1	whitish yellow
pisiformis	PI-308117	Czechoslovakia	9	2	3	5	8	-	3	6	5	5	9	30	7-14	8-19	7-12	1	whitish yellow
pisiformis	BN-18719-67	USSR	9	1	2	4	6	-	2	7	4	0	9	34	7-14	8-19	7-12	1	whitish yellow
**pisiformis*	BN-18720-67	USSR	5	1	1	1	4	1	1	5	3	1	9	36	7-12	8-19	6-28	1	yellow
species	M-1083	Chouteau Co., MT	9	3	6	3	7	-	5	9	4	0	9	15	6-21	7-4	-	3	-
sylvatica tenuifolia	BN-18721-67	USSR	9	1	2	3	7	-	3	0	3	0	9	24	7-1	7-22	-	3	reddish white
**tenuifolia*	P-15606	SD Agr. Exp. Sta.	1	1	1	1	1	1	1	5	1	2	5	36	7-8	8-12	-	3	purple
unijuga	BN-18722-67	USSR	9	3	8	0	0	3	8	0	6	0	0	-	-	-	0	1	-

* Best performer.

TABLE 5. Project I. Initial Evaluation Plantings. Botanical and common names of legumes in Field 2. Planted at the Bridger PMC for revegetation of mined lands.

Species	Common Name
Astragalus bisulcatus	twogrooved loco
Astragalus cicer	cicer milkvetch
Astragalus crassicarpus	groundplum milkvetch
Astragalus galegiformis	tall milkvetch
Astragalus glycyphyllos	liquorice milkvetch
Astragalus species	milkvetch species
Crotalaria juncea	sunn crotalaria
Desmodium intortum	-
Glycyrrhiza lepidota	American licorice
Hedysarum boreale	northern sweetvetch
Hedysarum species	sweetvetch species
Lathyrus odoratus	sweetpea
Lespedeza capitata	roundhead lespedeza
Lupinus albicaulis	pine lupine
Lupinus argenteus	silvery lupine
Lupinus species	lupine species
Medicago coerulea	azure medic
Medicago falcata	yellowflowered alfalfa
Medicago sativa	alfalfa
Medicago tianschanica	Tien Shan medic
Melilotus alba	white sweetclover
Melilotus alba annua	hubam sweetclover
Melilotus alba desri	-
Onobrychis viciaefolia	sainfoin
Oxytropis besseyi	Besseyi pointvetch
Oxytropis riparia	RubyValley pointvetch
Petalostemon candidum	white prairieclover
Petalostemon purpureum	purple prairieclover
Petalostemon species	prairieclover species
Psoralea esculenta	breadroot scurfpea
Psoralea species	scurfpea species
Psoralea tenuiflora	slimflower scurfpea
Swainsona salsula	Swainsonpea
Thermopsis species	thermopsis species
Trifolium fragiferum	strawberry clover
Trifolium hybridum	alsike clover
Trifolium lupinaster	lupine clover
Trifolium medium	zigzag clover
Trifolium pratense	red clover
Trifolium species	clover species
Vicia americana	American vetch
Vicia amurensis	-

TABLE 5. Project I. Initial Evaluation Planting. Botanical and common names of legumes in Field 2. Planted at the Bridger PMC for revegetation of mined lands. Continued.

Species	Common Name
Vicia cracca	cow vetch
Vicia pannonica	Hungarian vetch
Vicia pisiformis	pea vetch
Vicia species	vetch species
Vicia sylvatica	wood vetch
Vicia tenuifolia	bramble vetch
Vicia unijuga	pair vetch

Initial Evaluation of Grasses for Reclamation of Mined Lands - 1977

Sixty-four accessions of 32 grass species are being evaluated for reclamation of mined lands, range revegetation, and soil stabilization. Performance is being evaluated on seedling vigor, stand establishment, ground cover, plant uniformity, winter hardiness, and forage and seed production.

Methods and Materials

The 64 accessions were seeded April 11, 1977, in Field 2 at the Bridger PMC. Each accession was seeded in a 16-foot row, with the rows spaced 3 feet apart.

The planting was sprayed twice with 2 pounds-per-acre of 2,4-D to control broadleaved weeds -- once in early May and a second time in early June. All rows were also rotocut in mid-June and again in late August to reduce competition from other weedy species. The planting was irrigated three times. It was cultivated twice with a rotctiller in the latter part of the growing season.

Plant performance information was recorded on seedling vigor, date of emergence, and percent stand established during the year.

The evaluation area soil is Lohler silty clay loam on a 0% to 2% slope. The surface 10 inches is a heavy clay loam, underlain by 60 inches of sandy clay material. The soil is stratified below a depth of 20 inches. This deep soil is an Entisol of the subgroup Typic Ustifluvent, fine, montmorillonitic, calcareous, and frigid.

Table 6 shows the accession numbers, species, origin, and seedling-year performance. The best establishment-year performers are marked. Common names are listed on table 7.

TABLE 6. Project I. Initial Evaluation Plantings. Seedling-year performance of accessions planted April 11, 1977, for mined land reclamation. Bridger PMC.

Accession Number	Species	Origin	% Stand	Seedling Vigor 1/	Emergence Date
*PI-109012	*Agropyron cristatum*	Turkey	60	3	5-24
*Whitmar	*Agropyron inerme*	Pullman PMC	70	2	5-24
M-1202	*Agropyron inerme*	Lincoln Co., MT	65	3	5-24
M-1203	*Agropyron inerme*	Lincoln Co., MT	50	3	6-1
*M-1226	*Agropyron pseudorepens*	Musselshell Co., MT	85	2	5-24
*Rosana	*Agropyron smithii*	Bridger PMC	75	2	5-24
WY-742	*Agropyron smithii*	Converse Co., WY	0	-	-
WY-731	*Agropyron smithii molli*	Sweetwater Co., WY	0	-	-
WY-710	*Agropyron* species	Weston Co., WY	20	3	6-1
WY-741	*Agropyron* species	Converse Co., WY	15	4	5-24
WY-727	*Agropyron* species	Fremont Co., WY	10	5	6-1
M-1184	*Agropyron spicatum*	Ravalli Co., MT	10	5	6-1
M-1185	*Agropyron spicatum*	Ravalli Co., MT	15	3	6-1
M-1186	*Agropyron spicatum*	Ravalli Co., MT	30	3	6-1
M-1191	*Agropyron spicatum*	Missoula Co., MT	40	3	5-24
M-1105	*Agropyron spicatum*	Powell Co., MT	20	4	6-1
M-1201	*Agropyron spicatum*	Lincoln Co., MT	15	4	6-1
WY-759	*Agropyron spicatum*	Goshen Co., WY	5	5	5-24
*WY-724	*Agropyron trachycaulum*	Park Co., WY	80	2	6-1
WY-772	*Andropogon scoparius*	Weston Co., WY	0	-	-
*PI-172393	*Bromus inermis*	Turkey	90	1	5-17
M-1196	*Bromus marginatus*	Powell Co., MT	65	3	5-24
*M-1236	*Bromus marginatus*	Powell Co., MT	90	2	5-24
WY-592	*Carex* species	Yellowstone Nat. Park	0	-	-
M-1066	*Deschampsia caespitosa*	Roosevelt Co., MT	0	-	-

1/ Ratings: 1 - 9 with 1 best.
* Best performers.

TABLE 6. Project I. Initial Evaluation Plantings. Seedling-year performance of accessions planted April 11, 1977, for mined land reclamation. Bridger PMC.

Accession Number	Species	Origin	% Stand	Seedling Vigor	Emergence Date
M-1241	*Elymus cinereus*	Powell Co., MT	0	-	-
WY-734	*Elymus hirtiflorus*	Sweetwater Co., WY	0	-	-
BN-20620-73	*Elymus riparius*	Canada	35	3	5-24
WY-739	*Elymus* species	Albany Co., WY	0	-	-
P-15594	*Elymus triticoides*	Bridger PMC	0	-	-
BN-20622-72	*Elymus triticoides*	Versailles, France	20	4	6-1
M-1192	*Festuca idahoensis*	Missoula Co., MT	0	-	-
M-1175	*Festuca scabrella*	Meagher Co., MT	0	-	-
M-1178	*Festuca scabrella*	Sanders Co., MT	5	5	6-1
M-1179	*Festuca scabrella*	Sanders Co., MT	5	5	6-1
M-1193	*Festuca scabrella*	Missoula Co., MT	0	-	-
M-1197	*Festuca scabrella*	Powell Co., MT	0	-	-
M-1200	*Festuca scabrella*	Lincoln Co., MT	0	-	-
M-1230	*Festuca scabrella*	Lake Co., MT	0	-	-
M-1206	*Glyceria elata*	Carbon Co., MT	0	-	-
*Paloma	*Oryzopsis hymenoides*	Los Lunas, NM	75	2	5-24
M-1198	*Oryzopsis hymenoides*	Lincoln Co., MT	0	-	-
WY-757	*Oryzopsis hymenoides*	Carbon Co., WY	0	-	-
WY-730	*Poa arida*	Fremont Co., WY	5	5	6-8
WY-723	*Poa compressa*	Park Co., WY	0	-	-
WY-729	*Poa compressa*	Fremont Co., WY	0	-	-
M-1228	*Poa juncifolia*	Carbon Co., MT	0	-	-
M-1229	*Poa juncifolia*	Lake Co., MT	0	-	-
WY-722	*Poa juncifolia*	Park Co., WY	0	-	-
WY-738	*Poa juncifolia*	Albany Co., WY	10	4	6-8

* Best performer.

TABLE 6. Project I. Initial Evaluation Plantings. Seedling-year performance of accessions planted April 11, 1977, for mined land reclamation. Bridger PMC.

Accession Number	Species	Origin	% Stand	Seedling Vigor	Emergence Date
M-1180	*Puccinellia airoides*	Sanders Co., MT	0	-	-
WY-736	*Puccinellia airoides*	Albany Co., WY	5	4	6-8
PI-381008	*Puccinellia distans*	Iran	0	-	-
PI-381009	*Puccinellia distans*	Iran	5	5	6-8
BN-20784-73	*Puccinellia fasciculata*	Versailles, France	0	-	-
BN-20785-73	*Puccinellia festucaeformis* 2/	Versailles, France	0	-	-
BN-20787-73	*Puccinellia rupestris*	Versailles, France	0	-	-
M-1218	*Spartina gracilis*	Golden Valley Co., MT	0	-	-
WY-732	*Spartina gracilis*	Sweetwater Co., WY	0	-	-
WY-740	*Spartina gracilis*	Converse Co., WY	0	-	-
WY-755	*Spartina gracilis*	Johnson Co., WY	0	-	-
M-1181	*Sporobolus airoides*	Sanders Co., MT	0	-	-
WY-725	*Sporobolus airoides*	Fremont Co., WY	0	-	-
WY-737	*Sporobolus airoides*	Albany Co., WY	0	-	-

2/ Syn. with *P. grandis*.

TABLE 7. Project I. Initial Evaluation Plantings. Botanical and common names of entries planted in 1977 for revegetating mined lands. Field 2 - Bridger PMC.

Species	Common Name
Agropyron cristatum	crested wheatgrass
Agropyron inerme	beardless wheatgrass
Agropyron pseudorepens	false quackgrass
Agropyron smithii	western wheatgrass
Agropyron smithii molli	pubescent western wheatgrass
Agropyron spicatum	bluebunch wheatgrass
Agropyron trachycaulum	slender wheatgrass
Andropogon scoparius	little bluestem
Bromus inermis	smooth brome
Bromus marginatus	mountain brome
Carex species	sedge
Deschampsia caespitosa	tufted hairgrass
Elymus cinereus	basin wildrye
Elymus hirtiflorus	Wyoming wildrye
Elymus riparius	riverbank wildrye
Elymus triticoides	beardless wildrye
Festuca idahoensis	Idaho fescue
Festuca scabrella	rough fescue
Glyceria elata	tall mannagrass
Oryzopsis hymenoides	Indian ricegrass
Poa arida	plains bluegrass
Poa compressa	Canada bluegrass
Poa juncifolia	alkali bluegrass
Puccinellia airoides	Nuttall alkaligrass
Puccinellia distans	weeping alkaligrass
Puccinellia fasciculata	Torrey alkaligrass
Puccinellia festucaeformis 1/	- alkaligrass
Puccinellia rupestris	British alkaligrass
Spartina gracilis	alkali cordgrass
Sporobolus airoides	alkali sacaton

1/ Syn. with *Puccinellia grandis*.

Initial Evaluation of Browse Species for Reclamation of Mined Lands

Forbs and shrubs are an important component in native ranges in Montana and Wyoming. The demand for seed of these species has increased in recent years due to the increased mining for coal in the two states. Little or no work has been done on the selection of superior accessions of these species.

The purpose of this study is to evaluate as many browse species as possible for emergence, vigor, and stand longevity. The planned use of superior accessions is range revegetation and mined land reclamation.

Methods and Materials

One hundred seventy-nine accessions (table 8) of eighty-one species were seeded on April 6, 1977, in Field 2 at the Bridger PMC. Each accession was seeded in a 16-foot row, with the rows spaced 3 feet apart.

The planting was irrigated and hand weeded periodically throughout the summer and fall of 1977. The planting was also inspected regularly for plant emergence.

The soil in the study area is a Lohler silty clay loam.

Results

This planting was a failure in 1977 due to poor seedling emergence. Only seven accessions had any emergence. They were: *Atriplex canescens* -- WY-712, PL-2-71, and NM-621; *Helianthus*

species -- 'Grey Stripe,' 'Black Manchurian,' 'Armavirec,' and M-1132.

This planting should have been seeded in the fall, and possibly many of the species under a mist sprinkler system. The planting will be inspected regularly in 1978 for seedling emergence. There is a slight chance that some of the seed is still viable and will germinate after a winter stratification process. If no emergence is recorded in 1978, the planting will be plowed and reseeded in the fall of 1978.

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
M-1094	*Achillea lanulosa*	Western yarrow	Gallatin Co., MT
WY-626	*Achillea lanulosa*	Western yarrow	Sheridan Co., WY
M-1112	*Achillea millifolium*	Common yarrow	Missoula Co., MT
WY-606	*Achillea* species	Yarrow	Casper, Wyoming
WY-538	*Artemisia cana*	Silver sagebrush	Campbell Co., WY
WY-544	*Artemisia cana*	Silver sagebrush	Natrona Co., WY
WY-609	*Artemisia cana*	Silver sagebrush	Casper, Wyoming
WY-685	*Artemisia cana*	Silver sagebrush	Sheridan, Wyoming
WY-686	*Artemisia dracunculoides*	Falsetarragon sagewort	Wyoming
WY-769	*Artemisia dracunculus*	Tarragon sagewort	Weston Co., WY
WY-677	*Artemisia frigida*	Fringed sagewort	Sheridan Co., WY
WY-678	*Artemisia ludoviciana*	Louisiana sagewort	Sheridan Co., WY
WY-681	*Artemisia ludoviciana*	Louisiana sagewort	Sheridan Co., WY
WY-540	*Artemisia nova*	Black sagebrush	Sweetwater Co., WY
M-965	*Artemisia* species	Sagebrush	Carbon Co., MT
WY-295	*Artemisia spinescens*	Bud sagewort	Big Horn Co., WY
WY-542	*Artemisia tridentata*	Basin big sagebrush	Big Horn Co., WY
WY-694	*Artemisia tridentata*	Basin big sagebrush	Natrona Co., WY
WY-695	*Artemisia tridentata*	Basin big sagebrush	Natrona Co., WY
WY-761	*Artemisia tridentata*	Basin big sagebrush	Natrona Co., WY
WY-762	*Artemisia tridentata*	Basin big sagebrush	Natrona Co., WY
WY-545	*Artemisia tridentata tridentata*	Big sagebrush	Sublette Co., WY
WY-546	*Artemisia tridentata vaseyana*	Mountain big sagebrush	Sublette Co., WY
WY-547	*Artemisia tridentata wyomingensis*	Wyoming big sagebrush	Sublette Co., WY
A-72105	*Artemisia vulgaris*	Mugwort wormwood	Cheyenne, Wyoming
M-1326	*Asclepias tuberosa*	Butterfly milkweed	Saunders Co., NE
WY-647	*Aster* species	Fall aster	Teton Nat. Park, WY
PI-392280	*Atriplex bunburgana*	Saltbush	Australia
WY-640	*Atriplex canescens*	Fourwing saltbush	Ten Sleep, Wyoming

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
WY-712	*Atriplex canescens*	Fourwing saltbush	ARS, Cheyenne, WY
M-1122	*Atriplex canescens*	Fourwing saltbush	Fallon Co., MT
M-1123	*Atriplex canescens*	Fourwing saltbush	Fallon Co., MT
M-1124	*Atriplex canescens*	Fourwing saltbush	Ft. Keogh, MT
PL-2-71	*Atriplex canescens*	Fourwing saltbush	Bridger PMC
Wytana	*Atriplex canescens aptera*	Fourwing saltbush	Bridger PMC
NM-155	*Atriplex canescens*	Fourwing saltbush	Los Lunas PMC
NM-621	*Atriplex canescens*	Fourwing saltbush	Los Lunas PMC
WY-651	*Atriplex canescens + nuttallii*	Fourwing & Nuttall saltbush	Natrona Co., WY
PI-392281	*Atriplex cinerea*	Saltbush	Australia
WY-639	*Atriplex confertifolia*	Shadscale saltbush	Ten Sleep, WY
WY-650	*Atriplex confertifolia*	Shadscale saltbush	Natrona Co., WY
WY-696	*Atriplex confertifolia*	Shadscale saltbush	Natrona Co., WY
WY-713	*Atriplex confertifolia*	Shadscale saltbush	Sublette Co., WY
M-1154	*Atriplex confertifolia*	Shadscale saltbush	Carbon Co., MT
PL-73-68	*Atriplex halimus*	Mediterranean saltbush	Pleasanton PMC
PL-4-65	*Atriplex lentiformis*	Big saltbush	Pleasanton PMC
P-15658	*Atriplex nuttallii*	Nuttall saltbush	Bridger PMC
P-15586	*Atriplex nuttallii*	Nuttall saltbush	Carbon Co., WY
WY-588	*Atriplex nuttallii*	Nuttall saltbush	Big Horn Co., WY
WY-599	*Atriplex nuttallii*	Nuttall saltbush	Sweetwater Co., WY
WY-610	*Atriplex nuttallii*	Nuttall saltbush	Worland, Wyoming
WY-664	*Atriplex nuttallii*	Nuttall saltbush	Black Butte Coal Mine, WY
WY-665	*Atriplex nuttallii*	Nuttall saltbush	Uinta Co., WY
WY-683	*Atriplex nuttallii*	Nuttall saltbush	Natrona Co., WY
WY-705	*Atriplex nuttallii*	Nuttall saltbush	Carbon Co., WY
WY-708	*Atriplex nuttallii*	Nuttall saltbush	Weston Co., WY
WY-709	*Atriplex nuttallii*	Nuttall saltbush	Weston Co., WY
WY-714	*Atriplex nuttallii*	Nuttall saltbush	Sublette Co., WY

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
WY-756	*Atriplex nuttallii*	Nuttall saltbush	Lincoln Co., WY
M-989	*Atriplex nuttallii*	Nuttall saltbush	Carbon Co., MT
M-1129	*Atriplex nuttallii*	Nuttall saltbush	Ft. Keogh, MT
M-1130	*Atriplex nuttallii*	Nuttall saltbush	Fallon Co., MT
M-1136	*Atriplex nuttallii*	Nuttall saltbush	Fallon Co., MT
M-1148	*Atriplex nuttallii*	Nuttall saltbush	Chouteau Co., MT
WY-562	*Balsamorhiza sagittata*	Arrowleaf balsamroot	Johnson Co., WY
WY-745	*Balsamorhiza sagittata*	Arrowleaf balsamroot	Johnson Co., WY
WY-748	*Balsamorhiza sagittata*	Arrowleaf balsamroot	Sheridan Co., WY
WY-643	*Campanula rotundifolia*	Roundleaf harebell	Crook Co., WY
WY-646	*Campanula rotundifolia*	Roundleaf harebell	Teton Nat. Park, WY
WY-717	*Cleome serrulata*	RockyMountain beeplant	Hot Springs Co., WY
M-1227	*Cleome serrulata*	RockyMountain beeplant	Carter Co., MT
WY-746	*Cryptantha bradburiana*	Minerscandle	Sheridan Co., WY
M-1127	*Cryptantha bradburiana*	Minerscandle	Ft. Keogh, MT
M-1062	*Chrysopsis villosa*	Hairy goldenaster	Roosevelt Co., MT
WY-541	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Big Horn Co., WY
WY-611	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Teton Co., WY
WY-692	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Natrona Co., WY
WY-721	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Big Horn Co., WY
M-1138	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Fallon Co., MT
WY-693	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Natrona Co., WY
M-1213	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Carbon Co., MT
M-1214	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Carbon Co., MT
M-1215	*Chrysothamnus nauseosus*	Rubber rabbitbrush	Carbon Co., MT
WY-770	*Chrysothamnus viscidiflorus*	Douglas rabbitbrush	Natrona Co., WY
M-1128	*Chrysothamnus viscidiflorus*	Douglas rabbitbrush	Ft. Keogh, MT
M-1134	*Chrysothamnus viscidiflorus*	Douglas rabbitbrush	Fallon Co., MT
NB-132	*Desmanthus illinoensis*	Illinois bundleflower	Lincoln Co., NE

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
M-1058	*Echinacea angustifolia*	Black-eyed sampson	Roosevelt Co., MT
WY-628	*Echinocystis lobata*	Wild mockcucumber	Sheridan Co., WY
WY-591	*Eriogonum* species	Wildbuckwheat	Park Co., WY
WY-598	*Eriogonum* species	Wildbuckwheat	Yellowstone Nat. Park, WY
M-1106	*Eriogonum* species	Wildbuckwheat	Silver Bow Co., MT
M-1283	*Eriogonum* species	Wildbuckwheat	Carter Co., MT
WY-597	*Eriogonum umbellatum*	Sulfur wildbuckwheat	Yellowstone Nat. Park, WY
WY-447	*Eurotia lanata*	Winterfat	Washaki Co., WY
WY-602	*Eurotia lanata*	Winterfat	Sweetwater Co., WY
WY-652	*Eurotia lanata*	Winterfat	Natrona Co., WY
WY-654	*Eurotia lanata*	Winterfat	Natrona Co., WY
WY-682	*Eurotia lanata*	Winterfat	Natrona Co., WY
M-25	*Eurotia lanata*	Winterfat	Stillwater Co., MT
M-227	*Eurotia lanata*	Winterfat	Terry, Montana
M-292	*Eurotia lanata*	Winterfat	Blaine Co., MT
M-407	*Eurotia lanata*	Winterfat	Toole Co., MT
M-525	*Eurotia lanata*	Winterfat	Valley Co., MT
M-527	*Eurotia lanata*	Winterfat	Phillips Co., MT
M-547	*Eurotia lanata*	Winterfat	Prairie Co., MT
M-551	*Eurotia lanata*	Winterfat	Powder River Co., MT
M-566	*Eurotia lanata*	Winterfat	Musselshell Co., MT
M-625	*Eurotia lanata*	Winterfat	Big Horn Co., MT
M-763	*Eurotia lanata*	Winterfat	Wibaux Co., MT
M-805	*Eurotia lanata*	Winterfat	Granite Co., MT
M-962	*Eurotia lanata*	Winterfat	Madison Co., MT
M-966	*Eurotia lanata*	Winterfat	Carbon Co., MT
NM-333	*Eurotia lanata*	Winterfat	Los Lunas PMC
P-15595	*Eurotia lanata*	Winterfat	Goshen Co., WY
M-1194	*Gaillardia* species	Gaillardia	Missoula Co., MT

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
M-1091	*Geranium viscossissimum*	Sticky geranium	Gallatin Co., MT
M-1144	*Guem triflorum*	Prairie smoke	Chouteau Co., MT
M-1146	*Geum triflorum*	Prairie smoke	Chouteau Co., MT
WY-561	*Grayia spinosa*	Spiny hopsage	Carbon Co., WY
WY-586	*Helianthus annuus*	Annual sunflower	Big Horn Co., WY
M-1088	*Helianthus annuus*	Annual sunflower	Carbon Co., MT
M-1139	*Helianthus annuus*	Annual sunflower	Fallon Co., MT
M-1145	*Helianthus annuus*	Annual sunflower	Chouteau Co., MT
M-1131	*Helianthus maximiliana*	Maximilian sunflower	Fallon Co., MT
PMK-1425	*Helianthus maximiliana*	Maximilian sunflower	Manhattan PMC
WY-691	*Helianthus* species	Perennial sunflower	Natrona Co., WY
M-1132	*Helianthus* species	Perennial sunflower	Fallon Co., MT
Armavirec	*Helianthus* species	Perennial sunflower	University of Minnesota
Black Manchurian	*Helianthus* species	Perennial sunflower	Commercial
Grey Stripe	*Helianthus* species	Perennial sunflower	Commercial
PMK-1098	*Heliopsis helianthoides*	Sunflower heliopsis	Manhattan PMC
M-1096	*Iliamna rivularis*	Streambank globemallow	Gallatin Co., MT
M-1305	*Iliamna rivularis*	Streambank globemallow	Bozeman, Montana
M-1177	*Lewisia rediviva*	Bitterroot	Lake Co., MT
WY-669	*Liatris punctata*	Dotted gayfeather	Natrona Co., WY
M-1133	*Liatris punctata*	Dotted gayfeather	Fallon Co., MT
M-1149	*Liatris punctata*	Dotted gayfeather	Chouteau Co., MT
Eureka	*Liatris pycnostachya*	Kansas gayfeather	Manhattan PMC
M-1137	*Liatris* species	Gayfeather	Fallon Co., MT
WY-627	*Lithospermum ruderale*	Western gromwell	Sheridan Co., WY
M-1081	*Lithospermum ruderale*	Western gromwell	Gallatin Co., MT
M-1101	*Lithospermum ruderale*	Western gromwell	Nat. Bison Range, MT
WY-764	*Mentzelia decapetala*	Tenpetal blazingstar	Platte Co., WY

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
WY-771	*Mentzelia* species	Blazingstar	Natrona Co., WY
WY-629	*Nepeta cataria*	Catnip	Sheridan Co., WY
NM-724	*Penstemon jamesii*	James penstemon	Los Lunas PMC
M-1176	*Penstemon nitidus*	Waxleaf penstemon	Broadwater Co., MT
NM-618	*Penstemon palmeri*	Palmer penstemon	Los Lunas PMC
WY-608	*Penstemon* species	Penstemon	Casper, Wyoming
WY-700	*Penstemon* species	Penstemon	Natrona Co., WY
Bandera	*Penstemon strictus*	RockyMountain penstemon	Los Lunas PMC
M-1115	*Physalis heterophylla*	Clammy groundcherry	Carbon Co., MT
P-14947	*Polygonum lapathifolium*	Curltop ladysthumb	Pleasanton PMC
PL-396-63	*Polygonum lapathifolium*	Curltop ladysthumb	Pleasanton PMC
PL-529-63	*Polygonum persicaria*	Spotted smartweed	Pleasanton PMC
PI-376937	*Potentilla argentea*	Silver cinquefoil	Mont. State University
M-1303	*Potentilla buccoana*	Buccoan cinquefoil	Scotland
M-1304	*Potentilla gracilis*	Northwest cinquefoil	Stockton, CA
M-1033	*Ratabida columnifera*	Prairieconeflower	Fergus Co., MT
M-1061	*Ratabida columnifera*	Prairieconeflower	Roosevelt Co., MT
PMK-1153	*Ratabida pinnata*	Pinnate prairieconeflower	Manhattan PMC
NM-574	*Salvia carnosa*	Desert sage	Los Lunas PMC
Nekan	*Salvia pitcheri*	Pitcher sage	Marion Co., KS
WY-653	*Sarcobatus vermiculatus*	Black greasewood	Natrona Co., WY
WY-697	*Sarcobatus vermiculatus*	Black greasewood	Natrona Co., WY
WY-658	*Senecio* species	Groundsel	Uinta Co., WY
WY-661	*Senecio* species	Groundsel	Uinta Co., WY
WY-711	*Sphaeralcea coccinea*	Scarlet globemallow	Weston Co., WY
WY-660	*Wyethia amplexicaulis*	Mulesears wyethia	Uinta Co., WY
WY-625	*Wyethia* species	Wyethia	Crook Co., WY
M-1110	*Xerophyllum tenax*	Common beargrass	Missoula Co., MT
WY-642	*Yucca glauca*	Small soapweed	Natrona Co., WY

TABLE 8. Project I. Initial Evaluation Plantings. Accessions of browse species planted April 6, 1977, for mined land reclamation, Bridger PMC.

Accession Number	Species	Common Name	Origin
M-1166	*Yucca glauca*	Small soapweed	Richland Co., MT
NM-776	*Zinnia grandiflora*	RockyMountain zinnia	Los Lunas PMC
WY-614	Unknown	Aster?	Yellowstone Park, WY
WY-648	Unknown	Columbine	Teton Nat. Park, WY
WY-688	Unknown	-	Teton Nat. Park, WY
M-1098	Unknown	Yellow-flowered composite	Nat. Bison Range, MT

PROJECT II

INITIAL SEED INCREASE OF PLANT MATERIALS

The objective of this project is to provide seed of promising plant materials to be used in advanced testing and trials, and for exchange with other Plant Materials Centers and interested agencies; to provide a source of breeder seed of varieties developed by the Bridger Plant Materials Center and released under the seed certification programs of Montana and Wyoming.

1. Initial seed increase.

Initial Seed Increase

Seven accessions of various plant species were maintained for seed production during 1977. Two of these, 'Troy' Kentucky bluegrass and 'Tretana' birdsfoot trefoil, were in breeder fields in cooperation with Montana State University. The field of Tretana has replaced 'Tana' birdsfoot trefoil grown previously. Performance of each accession is recorded on table 1.

Supplemental water was applied to all the ISI plots prior to seed set this year.

Five other plant accessions were plowed out with sufficient seed supplies on hand for further evaluations and/or seed increase (table 2). Twenty additional entries were planted this year to develop or replenish seed supplies. Refer to table 3 for these entries and their origins. No establishment information was collected due to delayed emergence by some accessions.

TABLE 1. Project II. Seed production and performance of Initial Seed Increase plant materials - 1977.

Acc. No.	Species	Date Planted	Acres	Fertilizer[1] #/acre	1977 Harvest Date	1977 Yield #/acre	Average Yield #/acre	No. Years in Avg.	Seed Yield Variability #/acre
PI-285272(S)	*Agropyron inerme*	9/6/72	.0037	60N(SD)	7/8/77	105.4	123.33	5	T-228
Garrison (breeder)	*Alopecurus arundinaceus*	5/7/74	.12	100N(BC)	Not harvested in 1977.				
Tretana (breeder)	*Lotus corniculatus*	5/26/76	.65	60N(SD)	7/26/77	213.85	213.85	1	-
P-15657	*Oryzopsis hymenoides*	10/19/72	.0053	60N(SD)	Not harvested in 1977.[2]				
P-15601	*Phalaris arundinacea*	4/16/74	.0052	60N(SD)	6/24/77	300.00	250.90	3	75.7-377
Troy (breeder)	*Poa pratensis*	5/4/71	.052	100N(SD)	6/24/77	19.62	86.03	6	19.6-192
Bandera	*Penstemon stricta*	1975	.0055	60N(SD)	8/25/77	407.30	407.30	1	-

1/ Fertilizer applications: SD = sidedressed, BC = broadcast.
2/ All but 0 plants died.

TABLE 2. Project II. Initial Seed Increase. Plant materials plowed out - 1977.

Acc. No.	Species	Date Planted	Acres	Average Yield #/acre	No. Years in Avg.	Seed Yield Variability #/acre
PI-371702	*Alopecurus pratensis*	4/26/72	.0011	163.35	1	-
PI-372659	*Alopecurus pratensis*	4/26/72	.0011	81.7	1	-
NB-328	*Elymus giganteus*	4/24/70	.04	626.33	6	413-1213
PI-272136	*Elymus junceus*	4/14/71	.0014	334.0	1	-
Tana	*Lotus corniculatus*	4/26/74	.54	183.0 1/	1	-

1/ Yield-per-acre reflects 1975 crop. No seed produced in 1976.

TABLE 3. Project II. Initial Seed Increase. Plant materials planted at Bridger PMC in 1977.

Location	Accession	Species	Origin	Date Planted	Acres/row plus Total acres	No. of Rows
Field #1						
	PI-232127	*Agropyron spicatum*	Bridger PMC	4/21/77	.08 (.32)	4
	P-737	*Agropyron spicatum*	Pullman PMC	4/21/77	.08 (.32)	4
	P-15606	*Vicia tenuifolia*	Brookings, SD	4/22/77	.02	1
	P-6409	*Agropyron spicatum*	Pullman PMC	4/21/77	.08 (.32)	4
	M-448	*Festuca idahoensis*	Bridger PMC	4/22/77	.02	1
	PI-204455	*Koeleria cristata*	Turkey	4/22/77	.02	1
	PI-236877	*Oryzopsis hymenoides*	Canada	4/21/77	.02	1
	P-15584	*Andropogon scoparius*	Bridger PMC	4/21/77	.02	1
	M-21	*Sporobolus airoides*	Rosebud Co., MT	4/21/77	.02	1
	P-15587	*Bromus pumpellianus*	Bridger PMC	4/21/78	.02	1
	P-15649	*Agropyron spicatum*	Bridger PMC	4/21/77	.08 (.32)	4
	PI-371687	*Achillea borealis*	Palmer, Alaska	4/22/77	.01	.5
	M-640	*Hesperochloa kingii*	Bridger PMC	4/22/77	.01	.5
	M-241	*Andropogon hallii*	Bridger PMC	4/22/77	.02	1
	M-641	*Festuca scabrella*	Bridger PMC	4/21/77	.02	1
	C-56	*Muhlenbergia montana*	Bridger PMC	4/22/77	.02	1
Field #2						
	WY-577	*Sporobolus airoides*	Fremont Co., WY	4/18/77	.005 (.015)	3
	M-1030	*Agropyron trachycaulum*	Carbon Co., MT	4/18/77	.005 (.015)	3
	WY-573	*Poa arida*	Fremont Co., WY	4/18/77	.005 (.015)	3
	M-1032	*Agropyron smithii*	Yellowstone Co., MT	4/18/77	.005 (.015)	3

PROJECT IV

MANAGEMENT OF GRASSES, LEGUMES, SHRUBS, AND TREES
FOR SOIL AND WATER CONSERVATION USES

The objective of this project is to determine the optimum management methods necessary to obtain maximum soil protection and water conservation with grass, legume, shrub, and tree plantings.

One study is presently being conducted under this project:

1. Water requirements of Arnold hawthorn.

Water Requirements of Arnold Hawthorn

The minimum amount of moisture needed to maintain and grow *Crataegus arnoldiana* Arnold hawthorn is not sufficiently established to advise use of this species for conservation purposes on dryland or limited available water areas in Montana and Wyoming. The purpose of this study is to determine the minimum water needs for this species by comparing growth response to four soil moisture environments.

Methods and Materials

The planting is located east of Field 19 along the inside of a flat-bottom irrigation ditch lateral. Seventy-two plants of ND-430 Arnold hawthorn from the PMC at Bismarck, North Dakota, were originally planted May 25, 1970. The trees were spaced 5 feet apart in a single row 360 feet long. Seven dead plants were replaced May 5, 1971, from added original stock on hand.

The row of trees is divided into four treatment sections with 18 trees in each treatment. Small dikes of soil are used to separate the different treatment sections of ditch to control supplemental water and provide a closed system with no irrigation water lost from runoff. The lower end of the ditch is blocked off from irrigation water and receives only natural precipitation. The four treatments are:

1. 9 inches of supplemental water plus natural precipitation
2. 6 inches of supplemental water plus natural precipitation

3. 3 inches of supplemental water plus natural precipitation

4. natural precipitation only.

Supplemental water is provided after June 30 during the hotter and drier months of July and August and the fall months of September and October. All weeds and debris are removed prior to irrigation. Table 1 shows the dates and amounts of supplemental water provided, plus available precipitation, in 1977.

A parshall flume with a 9-inch throat width was installed in the ditch at the top of the treatment sections to measure prescribed amounts of irrigation water applied. An 8-inch diameter pipe was placed adjacent to this structure to bypass the water across the road into another ditch, while the desired flow is regulated; and to turn on and shut off supplemental water provided in the treatment sections of ditch.

The land area irrigated in these treatments was determined by measuring the cross section or wetted perimeter of the ditch multiplied by the length of row being treated. An engineering level on a tripod was used to survey the ditch gradient. It drops .2 feet in 270 feet of irrigated treatment length.

Height and spread of the plants were measured on December 16, 1977. The trees were periodically hoed and rogued to maintain a minimum of competition from other plants. All treatments were sprayed with 2 lbs-per-acre of Princep (simazine) in mid-November. The planting was not fertilized.

The soil is a deep alluvial, silty clay loam of the Heldt series, which is a Ustertic Camborthid. It is a fine, montmorillonitic, and mesic soil.

Results

The four treatments displayed slight growth differences in 1977; however, these differences did not clearly correspond to the amounts of moisture provided. Refer to table 2. A 42% increase in leader growth was shown for the four treatments when compared with growth averages in 1976, and annual branch spread or horizontal growth decreased 20% from last year and 30% from 1975.

Plant growth differences among treatments (1970-1977), although not outstanding, were noticable in both total average leader growth and total branch spread for the respective treatments. Treatments I through IV displayed a step-like decline in growth, with plants in Treatment IV (nonirrigated) averaging 6.01 inches less height and 5.23 inches less spread than plants in Treatment I (irrigated the most). Refer to table 3. These differences in growth have not been fully adjusted to include effects of variables such as wildlife use on various plants in Treatments I and II, nonuniform irrigation coverage on the south end of Treatment III, chemical damage to the last four plants in Treatment IV, and weak, replaced, or dead plants in all treatments.

No winter injury was recorded this year, and only a trace of insects and rust was observed. Plant vigor remained good to excellent.

TABLE 1. Project IV. Management Trials. Amount of water in acre-inches applied to four groups of Arnold hawthorn in 1977.

Date Irrigated	Treatment I	II	III	IV
8/3/77	6	6	3 1/	-
10/13/77	3	-	-	-
Precipitation 10/28/76-10/13/77	6.87	6.87	6.87	6.87
Total	15.87	12.87	9.87	6.87

1/ Trees #14 through #18 received no water due to sedimentation on the south end of the ditch, and the occurrence of sink holes in the ditch floor.

TABLE 2. Project IV. Management Trials. Average growth per year (in inches) of Arnold hawthorn irrigated at different frequencies, 1970-1977. Planted 8/25/70.

Year	Treatment I		Treatment II		Treatment III		Treatment IV	
	Leader'	Spread	Leader'	Spread	Leader'	Spread	Leader'	Spread
1970	-	-	-	-	-	-	-	-
1971	4.49	-1/	3.91	-1/	4.47	-1/	4.63	-1/
1972	8.83	5.64	8.82	5.36	10.24	6.61	9.07	6.28
1973	16.44	20.00	17.72	18.39	15.50	19.44	13.14	15.83
1974	21.08	11.22	21.36	12.11	23.97	11.35	20.28	11.50
1975	21.11	14.72	21.58	16.78	19.32	15.47	22.72	17.08
1976	13.53	16.50	12.44	15.78	9.82	13.23	12.19	11.86
1977	18.44	12.17	17.09	11.44	16.69	9.71	15.88	12.44
Total	103.92	80.25	102.92	79.86	100.01	75.81	97.91	74.99

1/ No branch spread recorded in 1971.

TABLE 3. Project IV. Management Trials. Inches of primary leader and spread growth of Arnold hawthorn irrigated at different frequencies - 1977. Planted 5/25/70. Measured 12/16/77.

Tree No.	Treatment I		Treatment II		Treatment III		Treatment IV	
	Leader	Spread	Leader	Spread	Leader	Spread	Leader	Spread
1	13.0	6.0	28.4	9.0	19.2	12.0	18.4	10.0
2	18.4	16.0	18.4	17.0	15.2	17.0	18.4	14.0
3	16.6	16.0	20.6	17.0	14.0	5.0	10.4	18.0
4	16.8	22.0	14.2	8.0	14.8	8.0	17.0	11.0
5	19.4	20.0	20.4	6.0	14.4	12.0	17.6	18.0
6	17.0	14.0	14.4	11.0	16.4	9.0	17.2	16.0
7	16.8	18.0	18.4	11.0	--1/	--1/	19.0	11.0
8	19.6	8.0	17.6	14.0	17.2	4.0	13.6	15.0
9	16.8	8.0	14.2	11.0	15.2	12.0	20.0	8.0
10	19.6	10.0	20.4	10.0	15.6	2.0	16.8	12.0
11	16.8	10.0	18.0	11.0	17.8	9.0	16.6	17.0
12	20.8	12.0	19.6	16.0	15.8	12.0	17.2	6.0
13	20.4	3.0	10.0	12.0	17.0	3.0	14.4	22.0
14	24.4	14.0	14.0	10.0	16.6	8.0	13.0	22.0
15	17.6	17.0	15.2	16.0	14.0	9.0	23.2	15.0
16	21.2	14.0	11.6	3.0	16.8	8.0	12.8	8.0
17	16.6	5.0	16.6	14.0	19.6	15.0	9.6	10.0
18	20.2	6.0	15.6	10.0	24.2	20.0	10.6	11.0
1977 Average	18.44	12.17	17.09	11.44	16.69	9.71	15.88	13.56

1/ Plant died in 1974.

PROJECT V

COMPARATIVE PERFORMANCE TRIALS

The objective of this project is to determine the comparative performance of species, varieties, or ecotypes for like uses under identical conditions; to determine from comparative performance the best plant for a specific use; or to determine by comparative performance the greatest resistance or tolerance to adverse circumstances.

Five studies are presently being conducted under this project:

1. Adaptation and performance of prairie sandreed on a dryland site.
2. Adaptation and performance of bluebunch wheatgrass on a dryland site.
3. Adaptation and performance of Indian ricegrass on a dryland site.
4. Big Horn Ranch Field Evaluation Planting.
5. Cordero Mine Field Evaluation Planting.

Adaptation and Performance of Prairie Sandreed on a Dryland Site

Prairie sandreed *Calamovilfa longifolia* is a native, sod-forming, warm-season grass adapted to droughty, sandy sites throughout eastern Montana and Wyoming. Its ability to produce abundant foliage in the summer growing season and its sod-forming habit make it a desirable conservation plant for reseeding abandoned cropland and deteriorated rangeland.

The purpose of this study is to evaluate the comparative adaptation and performance of six accessions of prairie sandreed that are in advanced stages of development. The characteristics to be evaluated are stand establishment, seedling vigor, aggressiveness, weed suppression, dry matter production, and stand longevity.

Methods and Materials

The six accessions included in this study are:

P-15588 ('Goshen')	-	Goshen County, Wyoming
P-15589	-	Prairie County, Montana
P-15635	-	Rosebud County, Montana
NDG-95	-	Bowman County, North Dakota
C-12	-	Elbert County, Colorado
C-19	-	Kiowa County, Colorado

The accessions were seeded May 2, 1969, in Field 14 on the PMC in plots 8 by 103 feet, replicated four times in a randomized complete block design. The rows are spaced 14 inches apart. No fertilizer or irrigation water is applied, and no weed control measures were used in 1977.

Due to lack of moisture during the 1977 growing season, this study was not harvested.

Adaptation and Performance of Bluebunch Wheatgrass on a Dryland Site

Bluebunch wheatgrass *Agropyron spicatum* is a native, cool-season bunchgrass common on rangelands throughout Montana and Wyoming, as well as other states. It is adapted to a wide range of climatic conditions and soils except areas with restricted drainage or those adversely affected by salinity or alkalinity. This drought-tolerant species is a desirable forage producer for use in reseeding deteriorated rangeland or abandoned cropland.

The purpose of this study is to evaluate stand establishment, dry matter production, and adaptation of twelve accessions of bluebunch wheatgrass and one mixed beardless-bluebunch wheatgrass number for use in range seedings. These selections are in advanced stages of development. 'Whitmar' beardless wheatgrass is included as the standard for comparison.

Methods and Materials

The species and accessions involved in this study are:

	Accession	Species	Origin
1.	Whitmar	*Agropyron inerme*	Washington
2.	PI-285272	*Agropyron inerme* & *A. spicatum*	Whitman Co., WA
3.	M-161	*Agropyron spicatum*	Wheatland Co., MT
4.	C-29	*Agropyron spicatum*	Grand Co., CO
5.	P-15623	*Agropyron spicatum*	Granite Co., MT
6.	P-15634	*Agropyron spicatum*	Park Co., WY
7.	P-15649	*Agropyron spicatum*	Idaho Co., ID
8.	M-883	*Agropyron spicatum*	Lincoln Co., MT
9.	PI-232127	*Agropyron spicatum*	Idaho Co., ID
10.	P-737	*Agropyron spicatum*	Joel, ID

	Accession	Species	Origin
11.	P-739	*Agropyron spicatum*	Umatilla National Forest, WA
12.	P-6409	*Agropyron spicatum*	Idaho
13.	P-7845	*Agropyron spicatum*	Winchester, ID
14.	P-7412	*Agropyron spicatum*	Oregon

The study was seeded in Field 10, May 1, 1974, in plots 5 feet wide by 14 feet long, replicated three times in a randomized complete block design. The rows are spaced 1 foot apart, with a single accession represented in each five-row plot. A hand-operated belt seeder was used to plant the seed 1/2 inch deep into a clean, packed seedbed. A uniform seeding rate of 12 pounds-per-acre was used. The plots were hoed and rogued twice during the 1977 growing season to control weeds. No irrigation water or fertilizer has been applied and none is planned.

The soil is a Haverson silty clay, Ustic Torrifluvent, fine-loamy, mixed, calcareous, and mesic.

Field notes on percent stand and plant height at cutting were recorded during the season. The plots were harvested June 28, 1977.

Eleven-foot sections of row were harvested from the three inside rows in each plot. The forage was bagged, tagged, air dried, and weights converted to pounds-per-acre. A Jari mower was used for harvesting. M-161 and P-7412 failed to establish a stand and will be omitted from the results section of this report.

Results

Stands varied from 95% for PI-285272, a mixture of *A. inerme* and *A. spicatum*, to 57% for P-15634 *A. spicatum* (table 1). The

other accessions had stands ranging from 66 percent to 90 percent.

The dry matter yield of P-6409 and PI-232127 *A. spicatum* and PI-285272, a mixture of *A. inerme* and *A. spicatum*, were significantly higher than the other nine accessions (table 1). The 3-year mean yields of these three accessions are also higher than those for the other accessions. The average yield in 1977 was 1411 pounds-per-acre. This is 56% lower than the average yield of 3189 pounds-per-acre in 1976. This is probably due to the lack of moisture in 1977. In both 1975 and 1976, two harvests were made from these plots, whereas in 1977 only one harvest was feasible.

Spring recovery varied from excellent for P-6409 *A. spicatum* and PI-285272 *A. inerme* & *A. spicatum* to poor for P-15634 *A. spicatum*, which was also the poorest producer.

TABLE 1. Project V. Comparative Performance Trials. Bluebunch wheatgrass study. Plant performance and dry matter production in pounds-per-acre of twelve *Agropyron spicatum* and *A. inerme* accessions on a dryland site at the Bridger PMC. Averages of three reps - 1977.

Acc. No.	Species	Stand	Spring Recovery	Height	Cutting Recovery	1977 Yield		3-Year Mean	3-Year Rank
		%		*inches*		*lbs/acre*		*lbs/acre*	
P-6409	*A. spicatum*	82	1 [1/]	25	2 [1/]	2249	a [2/]	4024	2
PI-285272	*A. inerme* & *A. spicatum*	95	1	24	1	2065	a	4821	1
PI-232127	*A. spicatum*	85	2	20	3	2032	a	3924	3
P-15649	*A. spicatum*	80	5	22	3	1585	b	3396	6
Whitmar	*A. inerme*	90	2	19	3	1541	b	3414	5
P-739	*A. spicatum*	83	3	20	4	1362	bc	2919	8
P-7845	*A. spicatum*	83	3	24	3	1319	bcd	3025	7
P-737	*A. spicatum*	83	3	22	4	1210	bcd	3573	4
M-883	*A. spicatum*	85	5	18	7	1045	cd	2469	9
C-29	*A. spicatum*	66	7	18	7	977	d	2133	11
P-15623	*A. spicatum*	82	5	22	5	945	d	2379	10
P-15634	*A. spicatum*	57	9	19	6	598	e	1695	12
Average						1411			

1/ Rated 1 - 9 with 1 best.
2/ Duncan's Multiple Range Test @ P = .05, CV = 14.52%.

Adaptation and Performance of Indian Ricegrass on a Dryland Site

Indian ricegrass *Oryzopsis hymenoides* is a native bunchgrass on rangelands in Montana and Wyoming, as well as other states. It is adapted to droughty soils, sands, and desert areas in precipitation zones ranging from 8 to 15 inches annually. This drought-tolerant species is important for erosion control purposes, affords considerable forage for livestock, and provides food and cover for wildlife.

The purpose of the study is to evaluate stand establishment, ground cover provided, dry matter production, and adaptation of eight accessions of Indian ricegrass in advanced stages of development, primarily for erosion control uses.

Methods and Materials

The accessions included in this study are:

	Accession	Origin
1.	P-15636	Sheridan Co., Montana
2.	M-700	Toole Co., Montana
3.	P-15657	Hill Co., Montana
4.	P-15597	Yellowstone Co., Montana
5.	P-15650	Musselshell Co., Montana
6.	P-2575	Whitebird, Idaho
7.	PI-236877	Canada
8.	Paloma (P-15615)	Colorado

The study was seeded in Field 10 on March 1, 1974, in plots 5 feet wide by 14 feet long, replicated four times in a randomized complete block design. The rows are spaced 1 foot apart with a single accession represented in each five-row plot. A hand-operated belt

seeder was used to plant the seed 1/2 inch deep into a clean, packed seedbed. A uniform seeding rate of 12 pounds-per-acre was used. The plots were hoed and rogued once, and spot sprayed with 2,4-D once during the growing season to control weeds. No irrigation water or fertilizer has been applied and none is planned.

The soil is a Haverson silty clay, Ustic Torrifluvent, fine-loamy, mixed, calcareous, and mesic.

Field notes on percent stand and plant height at bloom were recorded during the growing season. The plots were harvested June 29, 1977. Eleven-foot sections of row were harvested from the three inside rows in each plot. The forage was bagged, tagged, air dried, and weights converted to pounds-per-acre. The plots were cut with a Jari mower.

Results

Stands vary from 89% for M-700 and PI-236877 to 75% for 'Paloma' (table 2). Compared to 1976, the stands of all accessions remained essentially the same in 1977. PI-236877 was the tallest accession, 18 inches, while P-15657 was the shortest, 9 inches.

The average dry matter production of all accessions in 1977 was 768 lbs/acre. This is 59% lower than the average in 1976 and 64% lower than the 1975-1977 3-year mean of 2139 lbs/acre. Yield varied from 950 lbs/acre for PI-236877 to 381 lbs/acre for P-15657. Table 2 illustrates the significant difference in yield among the

eight accessions. The 1975-1977 3-year mean yield varies from 2651 lbs/acre for PI-236877 to 1721 lbs/acre for P-15657.

TABLE 2. Project V. Comparative Performance Trials. Plant performance and dry matter production in pounds-per-acre of eight Indian ricegrass accessions on a dryland site at the Bridger PMC. Harvested 6/29/77. Averages of four reps - 1977.

Acc. No.	Spring Recovery	Stand	Height at Bloom	1977 Yield	3-Year Mean	3-Year Rank
		%	*inches*	*lbs/acre*	*lbs/acre*	
PI-236877	1 [1/]	89	18	950 a [2/]	2651	1
Paloma	5	75	14	932 a	1803	7
M-700	2	89	12	907 ab	2377	2
P-2575	3	81	17	862 ab	2289	3
P-15650	4	85	15	763 ab	2285	4
P-15597	4	83	16	758 ab	2097	5
P-15636	4	86	13	592 bc	1890	6
P-15657	6	85	9	381 c	1721	8

1/ Rated 1 - 9 with 1 best.
2/ Duncan's Multiple Range Test @ P = .05, CV = 26.44%.

Big Horn Ranch Field Evaluation Planting

The purpose of this planting is to evaluate and select promising grasses, legumes, and woody materials for use in the reclamation of mined land in the Powder River formation of north-central Wyoming.

The site was selected and the cooperative agreement with the SUNOCO Energy Development Company was signed April 12, 1976. The site -- 10 acres in the NW¼ of the SE¼, Section 10, T47N, R82W -- is located approximately 16 miles south of Buffalo, Wyoming, on old Highway 87 along the middle fork of Crazy Woman Creek.

The elevation of the site is approximately 4800 feet. It is located in an area that has averaged 13.95 inches of precipitation annually for 30 years.

Soils in this area are of the Stoneham and Kim series. The Stoneham series is a fine-loamy, mixed, mesic, Ustollic Haplargid. The Kim series is a fine-loamy, mixed, calcareous, mesic, Ustic Torriorthent.

Both of these soils are deep to moderately deep, fine-loamy soils and represent approximately 2 million acres (25%) in the Powder River Basin.

Performance on stand, ground cover, erosion control, and forage yields will be taken at least once a year. Ocular estimates of seedling stands, growth rate, vigor, drought tolerance, and winter hardiness are being taken.

Part I

Methods and Materials

Seventy-three accessions -- 58 grasses, 4 legumes, and 11 forbs and shrubs -- were planted April 14, 1976. The seed was planted with a belt seeder on 3-foot spacing, in 16-foot rows. Adequate amounts of seed were planted to insure good opportunity for stand establishment. Two accessions of shrubs were planted from root stock material. No supplemental irrigation water was applied.

Field notes were taken on stand, vigor, forage and seed production, ground cover, spring recovery, drought resistance, and winter injury in 1977.

Results

Performance of the 73 accessions is shown in table 3. There are no plants of five accessions. Some of the more outstanding accessions were:

'Parkway' crested wheatgrass *Agropyron cristatum* had an excellent stand and plant vigor, and very good forage and seed production.

'Critana' thickspike wheatgrass *Agropyron dasystachyum* had an excellent stand and plant vigor, and good forage and seed production.

'Nordan' crested wheatgrass *Agropyron desertorum* had an excellent stand, plant vigor, and forage and seed production.

C-29 bluebunch wheatgrass *Agropyron spicatum* had excellent plant vigor, and very good stand, forage and seed production.

TABLE 3. Project V. Big Horn Ranch Field Evaluation Planting. Performance of 73 accessions of grasses, legumes, forbs, and shrubs grown on a dryland site at Buffalo, Wyoming - 1977. Planted 4/14/76.

Species	Accession	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Spring Recovery	Drought Resistance	Winter Injury	Height (inches)
Agropyron cristatum	Parkway	1[1]	1[1]	2[1]		2[1]	1[1]	3[1]	1[1]	1[1]	0[2]	18
Agropyron dasystachyum	Critana	1	1	3	6[1]	3	1	2	1	1	0	-
Agropyron desertorum	Nordan	1	1	1		1	1	2	1	1	0	27
Agropyron inerme	Whitmar	2	1	4		3	1	3	1	1	0	31
Agropyron intermedium	Oahe	2	2	3	7	3	1	4	1	1	0	32
Agropyron riparium	Sodar	3	2	4		5	3	4	2	1	0	24
Agropyron sibiricum	P-27	2	2	2		3	1	3	1	1	0	24
Agropyron smithii	Arriba	3	2	4		5	2	3	2	1	0	25
Agropyron smithii	Barton	3	6	4	3	7	5	5	4	1	2	29
Agropyron smithii	Rosana	2	4	3	3	7	5	3	3	1	0	30
Agropyron spicatum	C-29	2	1	2		2	1	1	1	1	0	29
Agropyron spicatum	P-15623	3	3	5		5	3	5	2	1	0	25
Agropyron spicatum	P-15634	7	4	6		7	4	5	3	1	0	24
Agropyron spicatum	P-15649	4	4	5	3	6	5	4	4	1	3	34
Agropyron trachycaulum	Primar	1	1	2		2	1	2	1	5	0	36
Agropyron trichophorum	Luna	2	2	1		1	1	1	1	1	0	40
Agropyron trichophorum	NDG-759	3	3	1		2	1	1	3	1	0	37
Andropogon gerardii	Champ	6	5	3		-	5	3	5	1	0	16
Andropogon gerardii	NDG-4	3	2	2		-	4	2	2	1	0	36
Andropogon gerardii	P-15583	0										
Andropogon hallii	Oshkosh	3	3	2		-	2	2	4	1	0	18
Andropogon hallii	Woodward	3	2	3		-	3	3	3	1	0	16
Andropogon scoparius	Aldous	4	3	2		-	2	3	3	1	0	14

[1] Ratings: 1 = Excellent, 3 = Good, 5 = Fair, 7 = Poor, 9 = Very poor, 0 = None or dead.
[2] Ratings: 1 = 10%, 2 = 20%, 3 = 30%, 4 = 40%, 5 = 50%, 6 = 60%, 7 = 70%, 8 = 80%, 9 = 90%, 0 = None.

TABLE 3. Project V. Big Horn Ranch Field Evaluation Planting. Performance of 73 accessions of grasses, legumes, forbs, and shrubs grown on a dryland site at Buffalo, Wyoming - 1977. Planted 4/14/76. Continued.

Species	Accession	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Spring Recovery	Drought Resistance	Winter Injury	Height (inches)
Andropogon scoparius	Blaze	3	3	4		-	3	4	2	4	0	11
Andropogon scoparius	P-15584	2	1	1		-	1	1	1	1	0	22
Andropogon scoparius	Pastura	4	3	2		-	3	3	3	1	0	14
Bouteloua curtipendula	Killdeer	2	2	3		3	2	2	2	1	0	21
Bouteloua curtipendula	Pierre	2	1	3		4	3	2	1	1	0	21
Bouteloua gracilis	Lovington	3	6	7		9	6	6	5	1	1	12
Calamovilfa longifolia	Goshen	3	3	1	4	9	6	2	3	1	0	23
Deschampsia caespitosa	M-255	9	5						4		0	
Elymus angustus	Altai	2	3	5		6	3	4	2	5	0	42
Elymus canadensis	M-995	5	3	4		3	4	5	2	5	0	19
Elymus canadensis	M-1035	7	5	3		3	2	4	3	4	0	24
Elymus cinereus	P-15590	7	4	4		8	7	4	2	2	0	46
Elymus cinereus	P-15591	2	1	2		4	2	2	1	4	0	45
Elymus cinereus	P-15592	4	5	3		8	6	4	4	2	0	39
Elymus cinereus	P-15609	3	2	3		5	3	3	2	3	0	48
Elymus giganteus	NB-328	2	1	1	5	4	3	1	1	2	0	45
Elymus junceus	Mayak	2	2	6		5	2	5	1	6	0	30
Elymus junceus	Sawki	2	1	4		3	1	2	1	1	0	31
Elymus junceus	Vinall	3	2	5		4	1	3	2	4	0	31
Festuca arizonica	Redondo	4	1	3		6	5	4	2	2	0	30
Festuca ovina duriuscula	Durar	9	4	8		8	7	7	4	1	0	20
Koeleria cristata	PI-230256	9	5	8		0	-	8	4	1	1	3
Oryzopsis hymenoides	M-700	1	1	2		2	1	2	1	1	0	24

TABLE 3. Project V. Big Horn Ranch Field Evaluation Planting. Performance of 73 accessions of grasses, legumes, forbs, and shrubs grown on a dryland site at Buffalo, Wyoming - 1977. Planted 4/14/76. Continued.

Species	Accession	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Spring Recovery	Drought Resistance	Winter Injury	Height (inches)
Oryzopsis hymenoides	P-15597	1	1	1		1	1	1	1	1	0	27
Oryzopsis hymenoides	P-15650	2	1	1		1	1	1	1	1	0	29
Oryzopsis hymenoides	Paloma	1	1	2		2	1	2	1	1	0	25
Puccinellia airoides	M-41	0										
Puccinellia distans	M-1159	0							0		9	
Sorghastrum nutans	Holt	5	3	4		-	6	4	3	2	0	13
Sorghastrum nutans	Osage	3	4	4		-	3	4	4	3	2	16
Sorghastrum nutans	P-15640	2	3	3		-	2	-	3	4	1	16
Sporobolus airoides	M-21	9	5	8		8	5	6	5	1	0	24
Sporobolus cryptandrus	M-898	9	4	8		7	7	6	4	1	0	16
Stipa viridula	Lodorm	3	2	2		3	1	2	1	1	0	40
Stipa viridula	P-15604	2	2	3		4	1	3	2	1	0	36
Astragalus cicer	Lutana	4	3	2		6	2	3	3	2	0	9
Petalostemon candidum	NDL-56	3	4	3		3	1	4	4	1	0	10
Petalostemon purpureum	Kaneb	3	3	6		-	2	6	3	1	0	10
Petalostemon purpureum	NDL-54	4	3	6		-	1	6	3	1	0	11
Atriplex nuttallii	P-15658	9	2	2		-	3	2	1	1	1	17
Cercocarpus montanus	NM-715 3/	1	2	2			3	3	2	1	2	-
Eurotia lanata	NM-333	8	1	2		-	4	2	1	1	0	15
Hilaria jamesii	A-12044	9		8		-	-	8	-	1	-	3
Liatris pycnastachya	Eureka	0										
Penstemon jamesii	NM-724	5	3	7		6	2	6	2	1	0	10
Penstemon palmeri	NM-618	9	1	8			1	8	5	1	0	6

3/ Bareroot stock planted.

TABLE 3. Project V. Big Horn Ranch Field Evaluation Planting. Performance of 73 accessions of grasses, legumes, forbs, and shrubs grown on a dryland site at Buffalo, Wyoming - 1977. Planted 4/14/76. Continued.

Species	Accession	Stand	Vigor	Forage Production	Ability to Spread	Seed Production	Uniformity	Ground Cover	Spring Recovery	Drought Resistance	Winter Injury	Height (inches)
Penstemon strictus	Bandera	5	3	3		4	6	5	2	1	0	19
Rhus trilobata	WY-843	7	3	7			2	7	2	1	1	-
Rhus trilobata	WY-843 3/	1	4	5			3	-	4	1	4	-
Salvia pitcheri	Nekon	0							0		9	

3/ Bareroot stock planted.

'Primar' slender wheatgrass *Agropyron trachycaulum* had excellent stand and plant vigor, and very good forage and seed production. It rated only fair in drought resistance.

'Luna' pubescent wheatgrass *Agropyron trichophorum* had excellent forage and seed production, and very good stand and plant vigor.

P-15584 little bluestem *Andropogon scoparius*, the outstanding warm-season accession, had excellent plant vigor and forage and seed production.

NB-328 mammoth wildrye *Elymus giganteus* had excellent plant vigor and forage production.

All four Indian ricegrass *Oryzopsis hymenoides* accessions -- 'Paloma,' P-15597, P-15650, and M-700 -- had excellent to very good stands, plant vigor, and forage and seed production.

Two accessions, M-1159 *Puccinellia distans* and 'Nekan' *Salvia pitcheri*, had winter injury of 90% or greater.

Part II

Methods and Materials

On April 28, 1977, 28 accessions or varieties, with potential for mined land reclamation were seeded in a three-replication study at the Big Horn FEP. Information to be obtained from these plots is: stand establishment, stand longevity, forage production, and wildlife use. This will provide base information to compare with a similar planting to be planted on a coal mine near Gillette, Wyoming, in the fall of 1977.

Accessions seeded are:

Parkway	*Agropyron cristatum*	Crested wheatgrass
Critana	*Agropyron dasystachyum*	Thickspike wheatgrass
Nordan	*Agropyron desertorum*	Crested wheatgrass
Whitmar	*Agropyron inerme*	Beardless wheatgrass
Oahe	*Agropyron intermedium*	Intermediate wheatgrass
Sodar	*Agropyron riparium*	Streambank wheatgrass
P-27	*Agropyron sibiricum*	Siberian wheatgrass
Rosana	*Agropyron smithii*	Western wheatgrass
Revenue	*Agropyron trachycaulum*	Slender wheatgrass
Luna	*Agropyron trichophorum*	Pubescent wheatgrass
NDG-4	*Andropogon gerardii*	Big bluestem
Woodward	*Andropogon hallii*	Sand bluestem
P-15584	*Andropogon scoparius*	Little bluestem
Pierre	*Bouteloua curtipendula*	Sideoats grama
Lovington	*Bouteloua gracilis*	Blue grama
PMT-1181	*Buchloe dactyloides*	Buffalograss
Goshen	*Calamovilfa longifolia*	Prairie sandreed
P-15590	*Elymus cinereus*	Basin wildrye
NB-328	*Elymus giganteus*	Mammoth wildrye
Vinall	*Elymus junceus*	Russian wildrye
NM-333	*Eurotia lanata*	Winterfat
Redondo	*Festuca arizonica*	Arizona fescue
Paloma	*Oryzopsis hymenoides*	Indian ricegrass
P-15597	*Oryzopsis hymenoides*	Indian ricegrass
NDL-56	*Petalostemon candidum*	White prairieclover
Bandera	*Penstemon strictus*	Rocky Mountain penstemon
Lodorm	*Stipa viridula*	Green needlegrass
P-15604	*Stipa viridula*	Green needlegrass

Results

Percent stand was estimated on all plots on July 14, 1977 (table 4). Those accessions having at least a 75% stand were: 'Revenue' slender wheatgrass 97%, 'Critana' thickspike wheatgrass 82%, 'Whitmar' beardless wheatgrass 75%, 'Luna' pubescent wheatgrass 75%, and 'Vinall' Russian wildrye 75%. As a group, the warm-season grasses and the forbs and shrubs had the poorest stand. The stand of many of these will probably increase by the end of the next growing season.

TABLE 4. Project V. Big Horn Ranch Field Evaluation Planting. Estimates of seedling year stand of 28 accessions on a dryland site at Buffalo, Wyoming - 7/14/77. Planted 4/28/77.

Accession	Species	Common Name	Replications I	II	III	Avg.
			%	%	%	%
Parkway	*Agropyron cristatum*	Crested wheatgrass	50	75	70	65
Critana	*Agropyron dasystachyum*	Thickspike wheatgrass	85	75	85	82
Nordan	*Agropyron desertorum*	Crested wheatgrass	45	55	70	57
Whitmar	*Agropyron inerme*	Beardless wheatgrass	75	80	70	75
Oahe	*Agropyron intermedium*	Intermediate wheatgrass	75	75	70	73
Sodar	*Agropyron riparium*	Streambank wheatgrass	80	70	65	72
P-27	*Agropyron sibiricum*	Siberian wheatgrass	35	35	55	42
Rosana	*Agropyron smithii*	Western wheatgrass	50	75	40	55
Revenue	*Agropyron trachycaulum*	Slender wheatgrass	100	95	95	97
Luna	*Agropyron trichophorum*	Pubescent wheatgrass	65	75	85	75
NDG-4	*Andropogon gerardii*	Big bluestem	15	20	10	15
Woodward	*Andropogon hallii*	Sand bluestem	25	1	5	10
P-15584	*Andropogon scoparius*	Little bluestem	10	25	20	18
Pierre	*Bouteloua curtipendula*	Sideoats grama	30	40	45	38
Lovington	*Bouteloua gracilis*	Blue grama	25	35	70	43
PMT-1181	*Buchloe dactyloides*	Buffalograss	15	10	5	10
Goshen	*Calamovilfa longifolia*	Prairie sandreed	1	5	5	4
P-15590	*Elymus cinereus*	Basin wildrye	30	40	30	33
NB-328	*Elymus giganteus*	Mammoth wildrye	1	15	5	7
Vinall	*Elymus junceus*	Russian wildrye	70	85	70	75
NM-333	*Eurotia lanata*	Winterfat	1	5	15	7
Redondo	*Festuca arizonica*	Arizona fescue	1	5	1	2
Paloma	*Oryzopsis hymenoides*	Indian ricegrass	45	30	20	32
P-15597	*Oryzopsis hymenoides*	Indian ricegrass	5	10	5	7
NDL-56	*Petalostemon candidum*	White prairieclover	50	50	70	57
Bandera	*Penstemon strictus*	Rocky Mountain penstemon	1	5	15	7
Lodorm	*Stipa viridula*	Green needlegrass	10	15	5	10
P-15604	*Stipa viridula*	Green needlegrass	10	25	15	17

Cordero Mine Field Evaluation Planting

The purpose of this planting is to evaluate and select promising grasses, legumes, and woody materials for use in the reclamation of land disturbed from strip mining coal from the Fort Union formation.

The site was selected and a cooperative agreement with Cordero Mining Company was signed. The site is in the NE¼ of the NW¼ of Section 25, T46N, R71W and is located approximately 22 miles southeast of Gillette, Wyoming.

Part I

Methods and Materials

On April 11, 1978, 18 accessions or varieties with potential for mined land reclamation were seeded in a three-replication study at the Cordero Mine. Information to be obtained from these plots is: stand establishment, stand longevity, forage production, and wildlife use. The data obtained from this planting will be compared to the data obtained from the Big Horn Ranch Field Evaluation Planting near Buffalo, Wyoming.

Accessions seeded are:

Critana	*Agropyron dasystachyum*	Thickspike wheatgrass
Nordan	*Agropyron desertorum*	Crested wheatgrass
Whitmar	*Agropyron inerme*	Beardless wheatgrass
Rosana	*Agropyron smithii*	Western wheatgrass
PI-232127	*Agropyron spicatum*	Bluebunch wheatgrass
P-737	*Agropyron spicatum*	Bluebunch wheatgrass
P-6409	*Agropyron spicatum*	Bluebunch wheatgrass
P-15649	*Agropyron spicatum*	Bluebunch wheatgrass
P-15590	*Elymus cinereus*	Basin wildrye
P-15591	*Elymus cinereus*	Basin wildrye
P-15592	*Elymus cinereus*	Basin wildrye
NE-328	*Elymus giganteus*	Mammoth wildrye

Paloma	*Oryzopsis hymenoides*	Indian ricegrass
P-2575	*Oryzopsis hymenoides*	Indian ricegrass
P-15597	*Oryzopsis hymenoides*	Indian ricegrass
NDL-56	*Petalostemon candidum*	White prairieclover
Kaneb	*Petalostemon candidum*	Purple prairieclover
P-15604	*Stipa viridula*	Green needlegrass

Part II

Methods and Materials

Twenty-seven accessions were planted with a belt seeder on 4-foot spacing, in 14-foot rows on April 11, 1978. Adequate amounts of seed were planted to insure good opportunity for stand establishment.

Accessions seeded were:

Oahe	*Agropyron intermedium*	Intermediate wheatgrass
Sodar	*Agropyron riparium*	Streambank wheatgrass
P-27	*Agropyron sibiricum*	Siberian wheatgrass
Luna	*Agropyron trichophorum*	Pubescent wheatgrass
NDG-4	*Andropogon gerardii*	Big bluestem
Aldous	*Andropogon scoparius*	Little bluestem
Blaze	*Andropogon scoparius*	Little bluestem
Pastura	*Andropogon scoparius*	Little bluestem
P-15584	*Andropogon scoparius*	Little bluestem
Lutana	*Astragalus cicer*	Cicer milkvetch
Wytana	*Atriplex canescens aptera*	Fourwing saltbush
P-15658	*Atriplex nuttallii*	Nuttall saltbush
Pierre	*Bouteloua curtipendula*	Sideoats grama
Lovington	*Bouteloua gracilis*	Blue grama
PMT-1181	*Buchloe dactyloides*	Buffalograss
Goshen	*Calamovilfa longifolia*	Prairie sandreed
NM-333	*Ceratoides lanata*	Winterfat
Redondo	*Festuca arizonica*	Arizona fescue
Durar	*Festuca ovina duriuscula*	Hard fescue
PI-204455	*Koeleria cristata*	Prairie junegrass
PI-230256	*Koeleria cristata*	Prairie junegrass
NM-724	*Penstemon jamesii*	James penstemon
NM-618	*Penstemon palmeri*	Palmer penstemon
Bandera	*Penstemon strictus*	Rocky Mountain penstemon
Osage	*Sorghastrum nutans*	Yellow indiangrass
Holt	*Sorghastrum nutans*	Yellow indiangrass
P-15640	*Sorghastrum nutans*	Yellow indiangrass

APPENDIX TABLE 1. Comparative Performance Trials. Bluebunch wheatgrass study. Dry matter yields in pounds-per-acre of twelve *Agropyron spicatum* and *A. inerme* accessions grown on dryland at the Bridger PMC - 1977. Seeded 5/1/74.

Accession	Species	Replications I	II	III
Whitmar	*A. inerme*	1397	1798	1429
PI-285272	*A. inerme & A. spicatum*	1653	2086	2456
C-29	*A. spicatum*	1324	725	882
P-15623	*A. spicatum*	762	908	1164
P-15634	*A. spicatum*	547	608	640
P-15649	*A. spicatum*	1318	2005	1432
M-883	*A. spicatum*	946	1263	925
PI-232127	*A. spicatum*	1548	2305	2244
P-737	*A. spicatum*	1208	1088	1333
P-739	*A. spicatum*	1080	1455	1551
P-6409	*A. spicatum*	2474	2124	2148
P-7845	*A. spicatum*	1135	1443	1379

APPENDIX TABLE 2. Comparative Performance Trials. Indian ricegrass study. Dry matter yields in pounds-per-acre of eight *Oryzopsis hymenoides* accessions grown on dryland and harvested on 6/29/77 at the Bridger PMC - 1977. Seeded 3/1/74.

Accession	Replications			
	I	II	III	IV
P-15636	515	806	407	640
M-700	736	1164	984	745
P-15657	367	471	367	317
P-15597	524	1272	393	844
P-15650	841	588	745	876
P-2575	908	1211	570	760
PI-236877	1039	783	824	1152
Paloma	1164	1080	553	931

PROJECT VI

CULTURAL AND ESTABLISHMENT TRIALS OF GRASSES, LEGUMES, AND FORBS

Cultural trials are used to determine the most positive and practical methods of establishing native and introduced species of grasses, legumes, and forbs used in soil and water conservation plantings.

Two studies are presently being conducted under this project:

1. Effects of irrigation on establishment of woody species.
2. Influence of kinds of stock on establishment of woody species.

Effects of Irrigation on the Establishment of Woody Species

Surface mining of coal and other minerals with related surface disturbances have created substantial acreages where woody species are needed for revegetation.

The purpose of this study is to determine the effect of various irrigation treatments on the establishment and growth of bareroot versus potted plants of Colorado blue spruce.

Methods and Materials

Bareroot and potted plants of Colorado blue spruce were purchased from Plumfield Nurseries, Inc., Fremont, Nebraska. The plants were 12-15 inches tall. They were hand planted in Field H at the Bridger PMC on May 12, 1976. Care was taken during planting so that the roots were exposed to air for only a minimum amount of time. The plot layout is a 4-replication, split-plot design with irrigation treatments as main plots and type of root stock as subplots. Each subplot consists of 12 plants.

The irrigation treatments were:

1. No irrigation.
2. Irrigation at planting -- May 12, 1976.
3. Irrigation at planting plus one additional irrigation -- May 12 and July 13, 1976.
4. Irrigation at planting plus two additional irrigations -- May 12, July 13, and September 9, 1976.

Each plant received one 3# coffee can (3 quarts) of water for each irrigation. No additional irrigation water will be applied through the remainder of the study.

The original height of each plant was measured. The growth since May 1976 of each surviving plant was measured on October 28, 1977.

The planting was weeded periodically throughout the 1977 growing season.

Results

Growth in 1977 was not affected by either the irrigation treatments applied in 1976 or by the type of transplants (bareroot or potted). See table 1.

The various irrigation treatments had no significant effect on survival of either the bareroot or potted transplants (table 2). After the second growing season, 56.7% of the potted transplants had survived and had an average growth in 1977 of .17 inch. This is a drop in survival from 95.3% in 1976. Twelve percent of the bareroot transplants were alive at the end of 1977. This is a drop in survival from 19.3% in 1976. The surviving bareroot transplants grew an average .16 inch in 1977.

This study should be planted again to compare results of different years.

TABLE 1. Project VI. Cultural Trials. The growth in inches of bareroot and potted transplants of Colorado blue spruce under four irrigation treatments applied in 1976 at the Bridger PMC - 1977. Averages of surviving plants. Planted May 12, 1976.

Type of Root Stock	Irrigation Treatment 1	2	3	4	Average
	inches	*inches*	*inches*	*inches*	
Potted	.17 (32)	.19 (21)	.16 (22)	.16 (32)	.17
Bareroot	.16 (3)	.15 (6)	.16 (22)	.16 (32)	.17
Average	.17	.18	.16	.16	.17

TABLE 2. Project VI. Cultural Trials. Percent survival of bareroot and potted transplants of Colorado blue spruce under four irrigation treatments applied in 1976 at the Bridger PMC - 1977. Planted May 12, 1976.

Type of Root Stock	Irrigation Treatment 1	2	3	4	1977 Average	1976 Average
	%	%	%	%	%	%
Potted	68.75	45.75	45.75	66.50	56.7 a[1/]	95.3 a[1/]
Bareroot	8.5	14.50	6.25	18.75	12.0 b	19.3 b
Average	38.6[2/]	30.1	26.0	42.6	34.3	57.3

1/ Duncan's Multiple Range Test @ P = .05.
2/ No significant difference.

Influence of Kinds of Stock on Establishment of Woody Species

Development of shrubs for revegetation and wildlife land plantings has a high priority in Montana and Wyoming. Surface disturbances will create a substantial acreage where shrubs will be needed for revegetation.

This study was planted to evaluate the rate of establishment, growth, and efficiency of four types of transplants: (1) tubelings in tinus pots, (2) tubelings in bee pots, (3) bareroot, and (4) potted plant material.

Methods and Materials

The shrub species used were:

Pink Lady	*Euonymus bungeanus*	Winterberry
A-12044	*Forestiera neomexicana*	New Mexico forestiera
WY-843	*Rhus trilobata*	Skunkbush sumac

Tubeling, bareroot, and potted plants came from the same seed source. The bareroot and potted plants were received from the Plant Materials Center, Los Lunas, New Mexico. The tubelings were received from the U.S. Forest Service, Coeur d'Alene, Idaho Nursery.

All plants were transplanted into Field 4 on May 26, 1977. Each treatment is replicated three times in a randomized complete block design. Each plot consists of eight plants. Row spacing and spacing within the row is 5 feet.

Holes for the transplants were made with a tractor-mounted, post-hole digger. Each transplant received 3 quarts of water at the time of planting. No additional water will be applied during

the duration of the study. Survival and growth information was recorded on October 13, 1977.

This study will be evaluated for 3 years, 1977-1979. It was also planted at the Meeker EPC and their Hesperus FEP.

Results

Average survival for all treatments was 66.76% (table 3). The species appears to have more influence on survival than the type of transplant. The best survival was potted WY-843 *Rhus trilobata* and tinus A-12044 *Forestiera neomexicana*. Both of these treatments had 100% survival. Only 33.3% of the potted 'Pinklady' *Euonymus bungeanus* survived the first summer.

The effect the various types of transplants have on establishment varies with species. The survival of potted transplants of WY-843 *Rhus trilobata* was better than bareroot, bee, or tinus transplants. Tinus and bee pot transplants survived better than transplants that were bareroot or potted for A-12044 *Forestiera neomexicana*. The survival of tinus pot transplants of Pink Lady *Euonymus bungeanus* was better than the survival of potted transplants. There were no significant differences in the survival among other types of transplants for each species.

The plants of WY-843 *Rhus trilobata* that were potted had the best growth, 8.22 inches. The surviving plants of Pink Lady *Euonymus bungeanus* from tinus, bareroot, and bee transplants lost height during the summer. This was caused by death of all or part of the stems soon after transplanting.

TABLE 3. Project VI. Cultural Trials. Percent survival and growth in inches of three woody species and four types of transplants on a dryland site at the Bridger PMC - 1977. Planted May 26, 1977.

Accession	Species	Type of Transplant	Survival	Growth
			%	*inches*
WY-843	*Rhus trilobata*	potted	100.0 a[1/]	8.22 a[2/]
A-12044	*Foresteria neomexicana*	tinus	100.0 a	1.82 bc
A-12044	*Foresteria neomexicana*	bee	91.7 ab	1.09 bc
WY-843	*Rhus trilobata*	bareroot	75.0 bc	1.87 bc
WY-843	*Rhus trilobata*	bee	66.7 cd	2.28 b
WY-843	*Rhus trilobata*	tinus	66.7 cd	2.16 b
A-12044	*Foresteria neomexicana*	bareroot	58.3 cd	1.79 bc
A-12044	*Foresteria neomexicana*	potted	58.3 cd	2.64 b
Pink Lady	*Euonymus bungeanus*	tinus	58.3 cd	-2.83 c
Pink Lady	*Euonymus bungeanus*	bareroot	51.1 de	-1.36 bc
Pink Lady	*Euonymus bungeanus*	bee	41.7 de	- .13 bc
Pink Lady	*Euonymus bungeanus*	potted	33.3 e	.26 bc
Average			66.76	1.49

1/ Duncan's Multiple Range Test @ P = .05; CV = 19.43%.
2/ Duncan's Multiple Range Test @ P = .05; CV = 38.49%.

APPENDIX TABLE 1. Project VI. Cultural Trials. Influence of Kinds of Stock on Establishment of Woody Species. Percent survival of three woody species and four types of transplants on a dryland site at the Bridger PMC - 1977. Planted May 26, 1977.

Accession	Species	Type of Transplant	Replication I	Replication II	Replication III
			%	%	%
Pink Lady	*Euonymus bungeanus*	bareroot	37.5	62.5	-[1/]
A-12044	*Foresteria neomexicana*	bareroot	37.5	62.5	75.0
WY-843	*Rhus trilobata*	bareroot	75.0	75.0	75.0
Pink Lady	*Euonymus bungeanus*	potted	12.5	37.5	50.0
A-12044	*Foresteria neomexicana*	potted	50.0	50.0	50.0
WY-843	*Rhus trilobata*	potted	100.0	100.0	100.0
Pink Lady	*Euonymus bungeanus*	tinus	50.0	87.5	37.5
A-12044	*Foresteria neomexicana*	tinus	100.0	100.0	100.0
WY-843	*Rhus trilobata*	tinus	75.0	75.0	50.0
Pink Lady	*Euonymus bungeanus*	bee	37.5	37.5	50.0
A-12044	*Foresteria neomexicana*	bee	87.5	100.0	87.5
WY-843	*Rhus trilobata*	bee	62.5	62.5	75.0

1/ Value missing.

APPENDIX TABLE 2. Project VI. Cultural Trials. Influence of Kinds of Stock on Establishment of Woody Species. Growth in inches of three woody species and four types of transplants on a dryland site at the Bridger PMC - 1977. Planted May 26, 1977.

Accession	Species	Type of Transplant	Replication I	II	III
			inches	*inches*	*inches*
Pink Lady	*Euonymus bungeanus*	bareroot	.58	-3.10	1/
A-12044	*Foresteria neomexicana*	bareroot	.42	.25	4.71
WY-843	*Rhus trilobata*	bareroot	4.08	4.17	-2.63
Pink Lady	*Euonymus bungeanus*	potted	.25	.08	.44
A-12044	*Foresteria neomexicana*	potted	5.75	.58	1.58
WY-843	*Rhus trilobata*	potted	4.66	8.38	11.63
Pink Lady	*Euonymus bungeanus*	tinus	-4.50	- .25	-3.75
A-12044	*Foresteria neomexicana*	tinus	2.42	.19	2.86
WY-843	*Rhus trilobata*	tinus	4.33	3.21	-1.06
Pink Lady	*Euonymus bungeanus*	bee	.58	.04	-1.00
A-12044	*Foresteria neomexicana*	bee	.29	1.22	1.77
WY-843	*Rhus trilobata*	bee	.05	4.35	2.45

1/ Value missing.

PROJECT VII

SEED INCREASE FOR FIELD PLANTINGS AND FOUNDATION SEED STOCKS

The objectives of the activities carried out under this project are to provide seed of developed plant materials in sufficient quantities for final testing in Field Plantings, and to provide foundation seed of released varieties for establishment of District Seed Increase fields and commercial seed production.

Seed Production

Thirteen accessions were grown for seed production on 33-1/2 acres in 1977. The first 6 months of 1977 were extremely dry and irrigation water was not available until the last week of May. This dry condition caused seed yields to be much lower than average. Nitrogen fertilizer was applied in the fall of 1976 or spring of 1977 to all grass species (table 1). Fertilizer was sidedressed on those accessions maintained in rows and broadcast on rhizomatous accessions grown solid. 'Lutana' cicer milkvetch, 'Wytana' fourwing saltbush, P-15658 Nuttall saltbush, and NDL-56 white prairieclover were not fertilized.

Seed Distribution

Through the Field Planting program of the Soil Conservation Service, seed of promising accessions is allocated to local Conservation Districts.

TABLE 1. Project VII. Seed Increase for Field Plantings. Performance of 13 accessions of grasses, legumes, and shrubs grown for seed under irrigation at the Bridger PMC - 1977.

Acc. No.	Species	Date Planted	Acres	1/ Fertilizer	Suppl. Water	Harvest Date	1977 Yield	Previous Average	No.Yrs. in Avg.
				lbs/acre	acre in.		#/acre	#/acre	
Critana	*Agropyron dasystachyum*	11/11/75	4.00	60	6	7/6	66	337	14
Rosana	*Agropyron smithii*	11/29/73	3.44	100	6	8/17	45	296	14
Garrison	*Alopecurus arundinaceus*	3/22/76	4.00	100	3	6/22	28	197	15
Lutana	*Astragalus cicer*	4/23/70	3.00	0	6	9/7	32	477	19
Wytana	*Atriplex canescens aptera*	4/24/72	1.18	0	3	9/27	158	371	10
P-15658	*Atriplex nuttallii*	11/30/73	.55	0	6	9/26	73	155	2
Goshen	*Calamovilfa longifolia*	5/27/70	4.31	60 2/	6	10/12	54	152	11
P-15590	*Elymus cinereus*	11/13/75	4.00	60	6	7/27	10	185	15
NB-328	*Elymus giganteus*	11/15/75	.50	60	6	7/28	370	608	7
P-15594	*Elymus triticoides*	11/18/75	4.00	100	0	7/28	153	214	15
Redondo	*Festuca arizonica*	12/3/73	1.83	60	6	7/25	45	240	7
P-15597	*Oryzopsis hymenoides*	2/28/74	2.00	60	6	7/12	95	274	11
NDL-56	*Petalostemon candidum*	3/15/74	.76	0	6	8/29	27	353	3

1/ Available nitrogen.
2/ Spring application.

The purpose of this project is to evaluate promising accessions for mine reclamation in cooperation with Conservation Districts, mining companies, and researchers.

Results

Seed of 31 accessions were distributed from the Bridger PMC to mining companies for surface mine reclamation plantings or to scientists doing research on surface mine reclamation (table 2).

TABLE 2. Seed shipped from the Bridger PMC for Surface Mine Reclamation Plantings or for research on surface mine reclamation. October 1977 - August 1978.

Date	Cooperator	Location	Accession	Species	Amount
10/11	American Colloid Company	Lovell, WY	Parkway	*Agropyron cristatum*	5½ lbs.
			Critana	*Agropyron dasystachyum*	5 lbs.
			Nordan	*Agropyron desertorum*	6 lbs.
			Alkar	*Agropyron elongatum*	10½ lbs.
			Whitmar	*Agropyron inerme*	6 lbs.
			Sodar	*Agropyron riparium*	6 lbs.
			Rosana	*Agropyron smithii*	6 lbs.
			Pierre	*Bouteloua curtipendula*	10 lbs.
			P-15597	*Oryzopsis hymenoides*	6 lbs.
			Wytana	*Atriplex canescens aptera*	1 lb.
			P-15658	*Atriplex nuttallii*	1 lb.
			P-15599	*Panicum virgatum*	9 lbs.
			M-41	*Puccinellia airoides*	1 lb.
			M-21	*Sporobolus airoides*	2 lbs.
			P-15604	*Stipa viridula*	6 lbs.
10/13	U.S. Forest Service	Billings, MT	M-255	*Deschampsia caespitosa*	3 lbs.
			PI-371739	*Festuca rubra*	50 grams
			Garrison	*Alopecurus arundinaceus*	3 lbs.
			Durar	*Festuca ovina duriuscula*	3 lbs.
1/16	Montana State University	Bozeman, MT	Goshen	*Calamovilfa longifolia*	19 lbs.
3/20	Atlantic Richfield Oil Co.	Gillette, WY	Goshen	*Calamovilfa longifolia*	35 lbs.
4/4	Pacific Power & Light Co.	Douglas, WY	NDL-56	*Petalostemon candidum*	3 lbs.
			Aldous	*Andropogon scoparius*	10 lbs.
5/3	Big Horn Ranch	Buffalo, WY	Critana	*Agropyron dasystachyum*	1 lb.
			Rosana	*Agropyron smithii*	3 lbs.

TABLE 2. Seed shipped from the Bridger PMC for Surface Mine Reclamation Plantings or for research on surface mine reclamation. October 1977 - August 1978. (Continued)

Date	Cooperator	Location	Accession	Species	Amount
5/3	Big Horn Ranch (Continued)		Lodorm	*Stipa viridula*	3 lbs.
			Lovington	*Bouteloua gracilis*	10 lbs.
5/3	Cordero Mining Company	Gillette, WY	Regar	*Bromus biebersteinii*	packet
			Nordan	*Agropyron desertorum*	packet
			Rosana	*Agropyron smithii*	packet
			Oahe	*Agropyron intermedium*	packet
			Lovington	*Bouteloua gracilis*	packet
			Pierre	*Bouteloua curtipendula*	packet
			Texoca	*Buchloe dactyloides*	packet
			Critana	*Agropyron dasystachyum*	packet
			P-15604	*Stipa viridula*	packet
			P-15597	*Oryzopsis hymenoides*	packet
			Wytana	*Atriplex canescens aptera*	packet
			Lutana	*Astragalus cicer*	packet
			Remont	*Onobrychis viciaefolia*	packet
			Parkway	*Agropyron cristatum*	packet
			Vinall	*Elymus junceus*	packet
			P-15649	*Agropyron spicatum*	packet
			Goshen	*Calamovilfa longifolia*	packet

PROJECT VIII

INITIAL EVALUATIONS OF NATIVE AND INTRODUCED TREES AND SHRUBS

The objective of this project is to evaluate the adaptation and general utility of native and introduced trees and shrubs for use in windbreak, shelterbelt, snowbreak, wildlife, recreation, and beautification plantings.

Two fields at the Bridger Center are devoted entirely to trees and shrubs under this project. Four studies are presently being conducted:

1. Geographic strain studies of woody plants in cooperation with Midwest PMCs. Initiated in 1961.
2. Adaptation and performance of trees and shrubs for soil stabilization, beautification, and wildlife. Initiated in 1960.
3. Adaptation and performance of trees and shrubs for soil stabilization, beautification, and wildlife. Initiated in 1976.
4. Initial propagation of woody species for reclamation of mined lands. Planted in 1977.

Geographic Strain Studies of Woody Plants in Cooperation with Midwest PMCs

The purpose of this study is to provide information on the range of adaptation for accessions of three woody species collected in different areas of the Great Plains; and to demonstrate that greater attention should be given to the origin of stock used in windbreaks and for other conservation plantings in the Great Plains.

Accessions of *Fraxinus pennsylvanica lanceolata* green ash and *Rhus trilobata* skunkbush sumac planted in 1961, 1962, and 1963 continue to be evaluated at the Bridger PMC. Each species is represented by accessions collected at sites ranging from North Dakota to Texas. These are planted in the Field 8 woody area at the Bridger PMC. This study was last reported on in 1975. Performance of the various entries will be reported again in 1980. Treatment is the same as provided those trees and shrubs in the next study initiated in 1960.

Adaptation and Performance of Trees and Shrubs for Soil Stabilization, Beautification, and Wildlife

The purpose of this study is to evaluate performance and select accessions of woody materials to protect soil from damage by wind and water, contribute food and cover for wildlife, establish on recreation areas, and for esthetics.

Woody Plantings Initiated in 1960

Methods and Materials

The woody species planted from 1960 through 1975 are being evaluated mainly in Field 8 at the Bridger PMC. This area consists of 4.78 acres. The entries are planted in rows on the contour. Irrigation water is supplied through contour ditches located on the uphill side of each tree row.

Information on the soils is based on a highly detailed soil survey of the PMC completed in 1974. The soil on the east and north one-half of Field 8 is McRae loam. The main slope varies from 8 to 15 percent and faces to the west. This soil is a deep calcareous Ustollic Camborthid. A small outcrop of hard sandstone and shale also occurs in this area. The west-southwest half of this field is Haverson silty clay loam on a 0% - 2% slope. It is a deep Ustic Torrifluvent. The surface 10 to 14 inches is clay material. The soil profile, particularly below 20 inches, is stratified.

The trees and shrubs in Field 8 were irrigated once this year. Insecticides and herbicides were not used.

The grass area between the rows was mowed September 12, 1977, with a rotary mower adjusted to leave a 4-inch stubble height. This aids in keeping weedy plants under control while leaving a cover of grass in the rows and between the shrubs and trees for some kinds of wildlife. A variety of wild animals and birds make use of various woody species and the planting area for food and cover.

The weather pattern is comprehensively shown following the Foreword in each Annual Technical Report.

Results

The status of plant performance was last reported in 1975, and will be reported again in 1980.

Woody Plantings Initiated in 1976

Methods and Materials

These woody species planted May 17 and 18, 1976, are being evaluated in the south part of Field H. The entries are planted in rows on the contour that are spaced a minimum of 20 feet apart. Irrigation water is provided through contour ditches surveyed and installed with a gradient of 2/10 of a foot for each 100 feet of length. The ditches are on the uphill side of each row of trees.

The soil in the major portion of the evaluation area is shown as Lohler silty clay loam on a 0% to 2% slope. A small area in the northeast corner is Lohler silty clay loam, saline, on a 0% to 4% slope. This soil series is classified as fine, montmorillonitic (calcareous), frigid; an Entisol of the Typic Ustifluvent suborder.

This planting of trees and shrubs was irrigated once in 1977.

The field was cultivated twice between the rows with tractor-drawn tillage equipment to control weeds. It was not necessary to use insecticides.

Results

Table 1 shows the number of trees and shrubs planted in 1976 and their survival record.

TABLE 1. Project VIII. Woody Plantings. Survival of 56 accessions of 35 woody species planted May 17 & 18, 1976, in Field H South at the Bridger PMC.

Accession	Species	Common Name	Number Planted	Plants Surviving 1976	Plants Surviving 9/1/77	9/1/77
				No.	*No.*	*%*
ND-629	*Acer ginnala*	Amur maple	9	8	8	89
Plumfield No.	*Acer saccharinum*	silver maple	10	9	8	80
Mich-823	*Alnus glutinosa*	black alder	9	9	1	11
Mich-1629	*Alnus glutinosa*	black alder	9	8	0	0
AM-2718	*Amorpha fruticosa*	indigo bush	10	10	10	100
AM-2138	*Ceanothus americanus*	Jersey tea	7	1	0	0
ND-471	*Celtis occidentalis*	hackberry	10	10	0	0
ND-649	*Celtis occidentalis*	hackberry	10	10	0	0
ND-1218	*Celtis occidentalis*	hackberry	10	10	8	80
SD-75	*Celtis occidentalis*	hackberry	10	10	4	40
SD-211	*Celtis occidentalis*	hackberry	10	9	7	70
NM-715	*Cercocarpus montanus*	mountainmahogany	17	14	13	76
Mich-765	*Cornus amomum*	silky dogwood	10	10	6	60
ND-363	*Elaeagnus angustifolia*	Russian olive	11	11	11	100
ND-364	*Elaeagnus angustifolia*	Russian olive	10	10	10	100
NM-476	*Elaeagnus angustifolia*	Russian olive	10	10	10	100
WY-292A	*Elaeagnus angustifolia*	Russian olive	10	10	10	100
Mich-421	*Elaeagnus umbellata*	Cardinal autumn olive	10	10	10	100
AM-2598	*Euonymus bungeanus*	winterberry	5	4	0	0
Pink Lady	*Euonymus bungeanus*	winterberry	14	6	0	0
A-12044	*Foresteria neomexicana*	New Mexico forestiera	19	17	17	90
A-3572	*Foresteria neomexicana*	New Mexico forestiera	11	11	11	100
Mand-12002	*Fraxinus pennsylvanica*	green ash	9	9	9	100
Plumfield No.	*Fraxinum pennsylvanica*	green ash	10	10	9	90
ND-777	*Gleditsia triacanthos*	honeylocust	12	12	12	100
ND-1202	*Gleditsia triacanthos*	honeylocust	10	10	7	70
ND-1220	*Gleditsia triacanthos*	honeylocust	10	9	9	90

TABLE 1. Project VIII. Woody Plantings. Survival of 56 accessions of 35 woody species planted May 17 & 18, 1976, in Field H South at the Bridger PMC. Continued.

Accession	Species	Common Name	Number Planted	Plants Surviving 1976	Plants Surviving 9/1/77	9/1/77
				No.	*No.*	*%*
ND-1221	*Gleditsia triacanthos*	honeylocust	10	9	8	80
AM-325	*Indigofera pseudotinctoria*	false anilindigo	8	2	0	0
ND-465	*Judlans nigra*	black walnut	10	7	0	0
ND-548	*Juglans* species	Manchurian walnut	9	6	0	0
AM-1538	*Lonicera maackii*	Amur honeysuckle	11	8	7	64
M-977	*Lycium halimifolium*	Chinese matrimonyvine	30	29	29	97
Midwest	*Malus baccata mandshurica*	Manchurian crabapple	10	5	4	40
Mich-1339	*Malus sargenti*	crabapple	10	1	0	0
ND-1153	*Morus alba tatarica*	Russian mulberry	10	10	10	100
ND-1163	*Morus alba tatarica*	Russian mulberry	12	10	8	67
ND-1169	*Morus alba tatarica*	Russian mulberry	10	10	8	80
ND-1170	*Morus alba tatarica*	Russian mulberry	10	10	9	90
AM-3041	*Parthenocissus quinquefolia*	Virginia creeper	10	0	0	0
Mich-88	*Populus canadensis eugenei*	Norway maple	10	10	10	100
NM-940	*Prunus fasciculata*	desert peachbush	10	7	5	50
ND-81	*Prunus spinosa*	blackthorn	10	3	1	10
NM-716	*Prunus virginiana*	common chokecherry	10	7	7	70
AM-3096	*Rhus glabra*	smooth sumac	5	3	3	60
NM-516	*Rhus trilobata*	skunkbush sumac	10	10	10	100
NM-1150	*Rhus trilobata*	skunkbush sumac	10	10	10	100
NM-1207	*Rhus trilobata*	skunkbush sumac	11	11	11	100
WY-843	*Rhus trilobata*	skunkbush sumac	10	8	7	70
Arnot	*Robinia fertilis*	bristly locust	20	19	18	90
Mich-433	*Salix pentandra*	laurel willow	10	10	9	90
Mich-520	*Salix purpurea nana*	blue arctic willow	5	0	0	0
M-1081	*Shepherdia argentea*	silver buffaloberry	10	9	8	80
Mich-1342	*Shepherdia argentea*	silver buffaloberry	10	6	4	40
ND-686	*Syringa amurensis*	Amur lilac	10	8	3	30
ND-723	*Ulmus pumila*	Siberian elm	11	10	10	91

Initial Propagation of Woody Species for Reclamation of Mined Land

There is a lack of superior adapted varieties of trees and shrubs in the commercial market to meet the varied conservation needs of Montana and Wyoming. An additional problem is that genetic identity of commercial planting stock is not always known or is not the same from year to year.

There is increased public pressure for reestablishing diverse plant communities on disturbed areas, particularly with native plants, to provide the best assurance of a long-lived community capable of regenerating itself under natural site conditions with little or no maintenance.

The purpose of this project is to make larger numbers of adapted varieties of trees and shrubs commercially available to meet the varied conservation needs of Montana and Wyoming.

Methods and Materials

One hundred fifty-three accessions of fifty-one species were planted in mid-May 1977 in Field 4 at the Bridger PMC. Fourteen of these accessions representing nine species were planted a second time in the fall on November 17, 1977. In addition, 21 other accessions and 5 species were also planted in the fall. Available literature was reviewed to determine the seed treatments needed for the various species prior to planting. Materials requiring stratification were potted in clean sand and then placed at room

temperature or in a cooler on March 15, 1977. Preplanting treatments used are listed in tables 2 and 3 along with accession number, species, and origin of material sown.

These woody species were planted in rows 5 feet long, spaced 1 foot apart. The beds were covered with a mulch of aspen fiber held in place with plastic netting to provide shade and reduce evaporation. The soil was kept cool and moist with an overhead sprinkler irrigation system equipped with mist nozzles. The system was activated one to three times most days during the growing season to maintain a favorable environment for germination and seedling development.

The beds were hand weeded twice during the summer, while the fallow areas between the beds were hoed and cultivated.

The propagation area soil is Lohler silty clay loam on a 0% to 2% slope. The surface 10 inches is a heavy clay loam. This layer is underlain with sandy clay to 60 inches deep. The soil materials are stratified below a depth of 20 inches. This deep soil is an Entisol of the suborder Typic Ustifluvent, fine, montmorillonitic, calcareous, and frigid.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC.

Accession Number	Species	Common Name	Origin	Treatment 1/
M-1105	*Acer glabrum*	Rocky Mountain maple	Sanders Co., MT	1
WY-668	*Acer glabrum*	Rocky Mountain maple	Natrona Co., WY	1
M-1306	*Acer grandidentatum*	Bigtooth maple	USFS, Utah	2
M-1016	*Acer saccharum*	Sugar maple	Carbon Co., MT	1
M-960	*Aesculus* species	Horsechestnut	Carbon Co., MT	1
M-1116	*Aesculus hippocastanum*	Horsechestnut	Carbon Co., MT	1
M-971	*Alnus sinuata*	Sitka alder	Ravalli Co., MT	1
PI-372658	*Alnus sinuata* var. *kenaica*	Sitka alder	Ninilchik, AK	1
WY-657	*Amelanchier alnifolia*	Saskatoon serviceberry	Uinta Co., WY	1
M-1210	*Amelanchier alnifolia*	Saskatoon serviceberry	Sanders Co., MT	1
M-923	*Amelanchier cusickii*	Cusicks serviceberry	Okanogan Co., WA	1
WY-539	*Amelanchier* species	Serviceberry	Platte Co., WY	1
M-973	*Arctostaphylos uva-ursi*	Kinnikinnick	Ravalli Co., MT	1
M-1027	*Arctostaphylos uva-ursi*	Kinnikinnick	Silver Bow Co., MT	1
WY-645	*Arctostaphylos uva-ursi*	Kinnikinnick	Crook Co., SD	1
PI-372603	*Arctostaphylos uva-ursi*	Kinnikinnick	Alaska	1
M-972	*Berberis repens*	Oregongrape	Ravalli Co., MT	1
M-1028	*Berberis repens*	Oregongrape	Silver Bow Co., MT	1
M-891	*Ceanothus prostratus*	Squawcarpet	Klickitat Co., WA	3
M-1209	*Celtis occidentalis*	Hackberry	Sanders Co., MT	1
M-1109	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Bitterroot Co., MT	1
WY-463	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Big Horn Co., WY	1
WY-767	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Platte Co., WY	1
M-306	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Broadwater Co., MT	1
M-366	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Silver Bow Co., MT	1

1/ Treatments: 1 = Stratified in moist sand 52 days @ 40°F.
2 = No pretreatment.
3 = Stratified in moist sand 136 days @ 40°F.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	Treatment 1/
M-367	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Madison Co., MT	1
M-1183	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Ravalli Co., MT	1
M-1187	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Ravalli Co., MT	1
M-1188	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Ravalli Co., MT	1
M-1189	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Ravalli Co., MT	1
WY-754	*Cercocarpus ledifolius*	Curlleaf mountainmahogany	Johnson Co., WY	1
WY-706	*Cercocarpus montanus*	Mountainmahogany	Albany Co., WY	1
M-1261	*Clematis lingusticifolia*	Western white clematis	Sanders Co., MT	1
WY-615	*Clematis* species	Clematis	Natrona Co., WY	1
PI-372687	*Cornus canadensis*	Bunchberry dogwood	Willow, AK	1
M-1104	*Cornus stolonifera*	Redosier dogwood	Sanders Co., MT	1
WY-623	*Cornus stolonifera*	Redosier dogwood	Natrona Co., WY	1
PI-372688	*Cornus stolonifera*	Redosier dogwood	Palmer, AK	1
AB-368	*Cotoneaster* species	Cotoneaster	Aberdeen PMC	1
ND-28	*Cotoneaster* species	Cotoneaster	Bismarck PMC	1
ND-20	*Crataegus arnoldiana*	Arnold hawthorn	Bismarck PMC	1
WY-635	*Crataegus douglasii*	Black hawthorn	Crook Co., WY	1
M-1208	*Crataegus douglasii*	Black hawthorn	Sanders Co., MT	1
WY-619	*Crataegus rivularis*	River hawthorn	Natrona Co., WY	1
WY-631	*Crataegus rivularis*	River hawthorn	Sheridan Co., WY	1
WY-671	*Crataegus saligna*	- hawthorn	Natrona Co., WY	1
M-967	*Crataegus* species	Hawthorn	Lake Co., MT	1
M-968	*Crataegus* species	Hawthorn	Lake Co., MT	1
M-1092	*Crataegus* species	Hawthorn	Gallatin Co., MT	1
M-1232	*Crataegus* species	Hawthorn	Lake Co., MT	1
M-1233	*Crataegus* species	Hawthorn	Lake Co., MT	1
WY-670	*Crataegus succulenta*	Fleshy hawthorn	Natrona Co., WY	1

1/ Treatments: 1 = Stratified in moist sand 52 days @ 40°F.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	Treatment 1/
PI-372693	*Dryas octopetala*	White dryad	Alaska	1
M-1243	*Elaeagnus angustifolia*	Russian-olive	Chouteau Co., MT	1
M-1244	*Elaeagnus angustifolia*	Russian-olive	Chouteau Co., MT	1
WY-687	*Elaeagnus* species	Silverberry	Teton Co., WY	4
M-974	*Elaeagnus* species	Silverberry	Wheatland Co., MT	1
M-974	*Elaeagnus* species	Silverberry	Wheatland Co., MT	5
M-1135	*Fraxinus pennsylvanica*	Green ash	Fallon Co., MT	6
NB-2	*Fraxinus pennsylvanica*	Green ash	Bridger PMC	6
ND-360	*Fraxinus pennsylvanica*	Green ash	Bridger PMC	6
NB-369	*Fraxinus pennsylvanica*	Green ash	Bridger PMC	6
ND-154	*Fraxinus pennsylvanica*	Green ash	Bridger PMC	6
ND-314	*Fraxinus pennsylvanica*	Green ash	Bridger PMC	6
M-1245	*Fraxinus pennsylvanica*	Green ash	Toole Co., MT	6
M-1247	*Fraxinus pennsylvanica*	Green ash	Liberty Co., MT	6
PI-325343	*Genista patida*	Woadwaxen	USSR	1
M-1152	*Juglans nigra*	Black walnut	Rosebud Co., MT	1
M-1026	*Juniperus communis*	Common juniper	Silver Bow Co., MT	1
M-1005	*Juniperus communis*	Common juniper	Musselshell Co., MT	1
WY-699	*Juniperus communis*	Common juniper	Natrona Co., WY	1
M-1008	*Juniperus horizontalis*	Creeping juniper	Garfield Co., MT	1
M-1010	*Juniperus horizontalis*	Creeping juniper	Prairie Co., MT	1
M-1013	*Juniperus horizontalis*	Creeping juniper	Powder River Co., MT	1
M-1003	*Juniperus scopulorum*	Rocky Mountain juniper	Stillwater Co., MT	1
M-1246	*Juniperus scopulorum*	Rocky Mountain juniper	Chouteau Co., MT	1

1/ Treatments: 1 = Stratified in moist sand 52 days @ 40°F.
4 = Stratified in moist sand 60 days @ 40°F.
5 = Soaked in concentrated sulfuric acid for 1 hour, & stratified in moist sand 52 days @ 40°F.
6 = Soaked in cold water for 68 hours.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	Treatment 1/
WY-583	*Juniperus scopulorum*	Rocky Mountain juniper	Sheridan Co., WY	1
WY-666	*Juniperus scopulorum*	Rocky Mountain juniper	Uinta Co., WY	1
WY-698	*Juniperus scopulorum*	Rocky Mountain juniper	Natrona Co., WY	1
M-1231	*Juniperus* species	Juniper	Lake Co., MT	1
M-296	*Malus hupehensis*	Crabapple	Bridger PMC	1
ND-246	*Malus hupehensis*	Crabapple	Bridger PMC	1
M-503	*Peraphyllum ramosissimum*	Common squawapple	Nephi, UT	1
WY-622	*Prunus virginiana melanocarpa*	Chokecherry	Natrona Co., WY	1
WY-633	*Prunus virginiana melanocarpa*	Chokecherry	Sheridan Co., WY	1
M-924	*Prunus padus*	Mayday tree	Granite Co., MT	1
M-1164	*Prunus pumila*	Sand cherry	Pondera Co., MT	1
M-1165	*Prunus pumila*	Sand cherry	Pondera Co., MT	1
M-905	*Prunus virginiana*	Common chokecherry	Carbon Co., MT	1
M-906	*Prunus virginiana*	Common chokecherry	Carbon Co., MT	1
M-907	*Prunus virginiana*	Common chokecherry	Big Horn Co., MT	1
M-908	*Prunus virginiana*	Common chokecherry	Carbon Co., MT	1
M-909	*Prunus virginiana*	Common chokecherry	Carbon Co., MT	1
M-910	*Prunus virginiana*	Common chokecherry	Carbon Co., MT	1
M-911	*Prunus virginiana*	Common chokecherry	Stillwater Co., MT	1
M-1141	*Prunus virginiana*	Common chokecherry	Sanders Co., MT	1
M-1234	*Prunus virginiana*	Common chokecherry	Lake Co., MT	1
M-1237	*Prunus virginiana*	Common chokecherry	Powell Co., MT	1
WY-701	*Prunus virginiana*	Common chokecherry	Fremont Co., WY	1
M-1142	*Prunus* species	Cherry	Sanders Co., MT	1
WY-616	*Prunus* species	Cherry	Wyoming	1
WY-630	*Prunus* species	Cherry	Sheridan Co., WY	1
WY-676	*Prunus* species	Cherry	Sheridan Co., WY	1

1/ Treatments: 1 = Stratified in moist sand 52 days @ 40°F.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	Treatment 1/
M-1113	*Prunus* species	Cherry	Missoula Co., MT	1
M-1140	*Prunus* species	Damsen plum	Carbon Co., MT	1
M-166	*Purshia tridentata*	Bitterbrush	Ravalli Co., MT	4
M-1084	*Purshia tridentata*	Bitterbrush	Gallatin Co., MT	4
M-1182	*Purshia tridentata*	Bitterbrush	Ravalli Co., MT	4
M-1190	*Purshia tridentata*	Bitterbrush	Ravalli Co., MT	4
M-1199	*Purshia tridentata*	Bitterbrush	Lincoln Co., MT	4
WY-749	*Purshia tridentata*	Bitterbrush	Natrona Co., WY	4
M-959	*Quercus macrocarpa*	Bur oak	Carbon Co., MT (1973)	4
WY-618	*Rhus trilobata*	Skunkbush sumac	Natrona Co., WY	5
WY-679	*Rhus trilobata*	Skunkbush sumac	Sheridan Co., WY	5
WY-773	*Rhus trilobata*	Skunkbush sumac	Weston Co., WY	5
WY-843	*Rhus trilobata*	Skunkbush sumac	Bridger PMC	5
M-792	*Rhus trilobata*	Skunkbush sumac	Granite Co., MT	5
M-1125	*Rhus trilobata*	Skunkbush sumac	Custer Co., MT	5
M-1020	*Ribes* species	Gooseberry	Beaverhead Co., MT	1 & 7
PN-636	*Rosa acicularis*	Prickly rose	Palmer, AK	1 & 8
PI-372752	*Rosa acicularis*	Prickly rose	College, AK	8
M-975	*Rosa nutkana*	Nootka rose	Lake Co., MT	1
WY-707	*Rosa rubrifolia*	Redleaf rose	Laramie Co., WY	8
M-1021	*Rosa* species	Rose	Silver Bow Co., MT	1

1/ Treatments:
1 = Stratified in moist sand 52 days @ 40°F.
4 = Stratified in moist sand 60 days @ 40°F.
5 = Soaked in concentrated sulfuric acid for 1 hour, & stratified in moist sand 52 days @ 40°F.
7 = Soaked in 10% sulfuric acid for 7 minutes, & stratified in moist sand 52 days @ 40°F.
8 = Soaked in concentrated sulfuric acid for 2 hours, & stratified in moist sand 52 days @ 40°F.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	Treatment 1/
M-1048	*Rosa* species	Rose	Phillips Co., MT	1 & 8
M-1099	*Rosa* species	Rose	Lake Co., MT	1 & 8
M-1103	*Rosa* species	Rose	Sanders Co., MT	1 & 8
M-1120	*Rosa* species	Rose	Fallon Co., MT	1
M-1151	*Rosa* species	Rose	Carbon Co., MT	1 & 8
WY-613	*Rosa* species	Rose	Teton Co., WY	1 & 8
WY-624	*Rosa* species	Rose	Natrona Co., WY	1 & 8
WY-632	*Rosa* species	Rose	Sheridan Co., WY	1 & 8
S-131	*Rosa ultramontana*	Mountain rose	Lake Chelan, WA	8
M-1007	*Rosa woodsii*	Woods rose	Petroleum Co., MT	1 & 8
M-1097	*Rubus* species	Raspberry	Gallatin Co., MT	1
PI-372753	*Salix phlebophylla*	Willow	Alaska	2
PI-372754	*Salix* species	Willow	Sagwon, AK	2
M-1111	*Sambucus caerulea*	Blue elderberry	Missoula Co., MT	9
M-969	*Sambucus* species	Elderberry	Lake Co., MT	4 & 9
ND-10	*Shepherdia argentea*	Silver buffaloberry	Bridger PMC	4
WY-672	*Shepherdia argentea*	Silver buffaloberry	Natrona Co., WY	4
WY-690	*Shepherdia argentea*	Silver buffaloberry	Natrona Co., WY	4
WY-702	*Shepherdia argentea*	Silver buffaloberry	Fremont Co., WY	4
WY-751	*Shepherdia argentea*	Silver buffaloberry	Sheridan Co., WY	4

1/ Treatments:
1 = Stratified in moist sand 52 days @ 40°F.
2 = No pretreatment.
4 = Stratified in moist sand 60 days @ 40°F.
8 = Soaked in concentrated sulfuric acid for 2 hours, & stratified in moist sand 52 days @ 40°F.
9 = Soaked in concentrated sulfuric acid for 15 minutes, & stratified in moist sand 60 days @ 40°F.

TABLE 2. Project I. Initial Evaluation Plantings. Accessions planted spring 1977 under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	Treatment 1/
M-834	*Shepherdia argentea*	Silver buffaloberry	Bridger PMC	4
M-844	*Shepherdia argentea*	Silver buffaloberry	Bridger PMC	4
WY-689	*Shepherdia canadensis*	Russet buffaloberry	Natrona Co., WY	10
WY-673	*Sorbus scopulina*	Greenes mountainash	Natrona Co., WY	4
M-1143	*Spiraea douglasii*	Douglas spiraea	Sanders Co., MT	2
M-1095	*Spiraea* species	Spiraea	Gallatin Co., MT	2
M-970	*Symphoricarpos* species	Snowberry	Lake Co., MT	11
WY-621	*Symphoricarpos* species	Snowberry	Natrona Co., WY	4
M-1294	*Ulmus japonica*	Japanese elm	Canada	2
M-1108	*Vaccinium membranaceum*	Thinleaved huckleberry	Missoula Co., MT	2

1/ Treatments: 2 = No pretreatment.
4 = Stratified in moist sand 60 days @ 40°F.
10 = Soaked in concentrated sulfuric acid for 25 minutes.
11 = Soaked in concentrated sulfuric acid for 1 hour, & stratified in moist sand 60 days @ 40°F.

TABLE 3. Project I. Initial Evaluation Plantings. Accessions planted November 17, 1977, under a mist sprinkler system in Field 4 at the Bridger PMC.

Accession Number	Species	Common Name	Origin	1/ Treatment
*M-1306	*Acer grandidentatum*	Bigtooth maple	USFS, Utah	1
M-1332	*Acer grandidentatum*	Bigtooth maple	Davis Co., UT	1
M-1333	*Acer grandidentatum*	Bigtooth maple	Cache Co., UT	1
M-1334	*Acer grandidentatum*	Bigtooth maple	Box Elder Co., UT	1
M-1335	*Acer grandidentatum*	Bigtooth maple	Box Elder Co., UT	1
M-1336	*Acer grandidentatum*	Bigtooth maple	Box Elder Co., UT	1
M-1337	*Acer grandidentatum*	Bigtooth maple	Wellsville Canyon, UT	1
M-1338	*Acer grandidentatum*	Bigtooth maple	Wellsville Canyon, UT	1
M-1339	*Acer grandidentatum*	Bigtooth maple	Wellsville Canyon, UT	1
M-1331	*Artemisia tridentata*	Big sagebrush	Carbon Co., WY	1
*ND-20	*Crataegus arnoldiana*	Arnold hawthorn	Bismarck PMC	2
*WY-635	*Crataegus douglasii*	Black hawthorn	Crook Co., WY	2
*M-1208	*Crataegus douglasii*	Black hawthorn	Sanders Co., MT	2
*WY-619	*Crataegus rivularis*	River hawthorn	Natrona Co., WY	2
*WY-631	*Crataegus rivularis*	River hawthorn	Sheridan Co., WY	2
*M-967	*Crataegus* species	Hawthorn	Lake Co., MT	2
*M-968	*Crataegus* species	Hawthorn	Lake Co., MT	2
*M-1092	*Crataegus* species	Hawthorn	Gallatin Co., MT	2
*M-1232	*Crataegus* species	Hawthorn	Lake Co., MT	2
*M-1233	*Crataegus* species	Hawthorn	Lake Co., MT	2
M-1329	*Eurotia lanata*	Winterfat	Johnson Co., WY	1
M-1340	*Fraxinus pennsylvanica*	Green ash	Carbon Co., MT	1
WY-777	*Juniperus horizontalis*	Horizontal juniper	Natrona Co., WY	1
*M-959	*Quercus macrocarpa*	Bur oak	Carbon Co., MT (1977)	1
M-1341	*Quercus macrocarpa*	Bur oak	Carbon Co., MT	1

1/ Treatments: 1 = No pretreatment.
2 = Stratified in moist sand 248 days @ 36°F to 40°F.

* Also planted in the spring 1977.

TABLE 3. Project I. Initial Evaluation Plantings. Accessions planted November 17, 1977, under a mist sprinkler system in Field 4 at the Bridger PMC. Continued.

Accession Number	Species	Common Name	Origin	1/ Treatment
M-1002	*Symphoricarpus albus*	Snowberry	Stillwater Co., MT	3
M-1242	*Symphoricarpus albus*	Snowberry	Powell Co., MT	3
WY-656	*Symphoricarpus occidentalis*	Western snowberry	Teton Nat'l. Park	3
WY-667	*Symphoricarpus occidentalis*	Western snowberry	Uinta Co., WY	3
WY-703	*Symphoricarpus occidentalis*	Western snowberry	Fremont Co., WY	3
M-976	*Symphoricarpus occidentalis*	Western snowberry	Lake Co., MT	3
M-1211	*Symphoricarpus occidentalis*	Western snowberry	Sanders Co., MT	3
*M-970	*Symphoricarpus* species	Snowberry	Lake Co., MT	3 & 4
M-1102	*Symphoricarpus* species	Snowberry	Lake Co., MT	3
*WY-621	*Symphoricarpus* species	Snowberry	Natrona Co., WY	3 & 4

1/ Treatments: 3 = Stratified in moist sand 98 days @ room temperature followed by 150 days @ 36°F to 40°F.
4 = Soaked in concentrated sulfuric acid for 1 hour & stratified in moist sand 248 days @ 36°F to 40°F.

* Also planted in the spring 1977.

PROJECT IX

SEED AND PLANTING STOCK PRODUCTION AND PROCESSING TRIALS OF GRASSES, LEGUMES, AND FORBS

The objective of this project is to determine the factors affecting the management, harvesting, and processing requirements necessary for maximum economical seed and planting stock production and recovery of new or unusual species used in soil and water conservation.

One study is presently being conducted under this project:

1. Inter-Center seed longevity study.

Inter-Center Seed Longevity Study

The longevity of seed of grasses, legumes, and forbs under natural warehouse storage conditions has been carefully investigated in the past by several groups and agencies. Because of the number of species being grown and the diversity of storage conditions under which the seed is kept at different locations, not all species have been tested under all conditions. Optimum conditions for storing seed for any length of time and retaining adequate viability for field use require cool temperatures and low seed moisture content. The latter is subject to variations in the relative humidity of the storage area. The RH then becomes a measurement of the adequacy of the storage environment along with temperature.

A number of species are under development at the Aberdeen, Bridger, and Los Lunas PMCs for use in soil and water conservation programs. The longevity of most of these species has not been tested under the storage conditions available at the three Centers. Longevity studies conducted by Plant Materials Centers in the West have shown that the Pullman, and especially the Aberdeen, Centers can maintain viability in seed longer than other locations because of drier air conditions. Storage conditions at Bridger and Los Lunas have not been tested.

The purpose of this study is to test the longevity of several grass, legume, and forb species grown at the three locations, and

to evaluate these storage conditions in comparison with those at Pullman and Aberdeen. The species to be tested represent those of primary conservation value in the West with which the three Centers are working. Also included are representative species used in the Pullman-Aberdeen tests of 1944 to 1959 for comparative purposes.

Results

Germination tests have been taken each May since 1970. The results are presented in tables 1 - 3, comparing each year's germination at each location with the original germination.

TABLE 1. Project IX. Inter-Center Seed Longevity Study. Yearly germination of 25 grass, legume, and browse species stored at Bridger, Montana. 1970-1978.

Accession	Species	Seed Origin 1/	Yr. Grown	Original Germination	Germination 1970	1971	1972	1973	1974	1975	1976	1977	1978
					%	%	%	%	%	%	%	%	%
Critana	*Agropyron dasystachyum*	B	1969	95	96	97	97	95	94	91	86	80	79
Greenar	*Agropyron intermedium*	P	1968	91	90	89	81	85	84	76	78	72	59
P-27	*Agropyron sibiricum*	A	1969	91	98	96	97	97	94	96	92	79	75
Rosana	*Agropyron smithii*	B	1969	87	93	92	90	93	91	88	79	52	28
Luna	*Agropyron trichophorum*	P	1969	93	91	88	88	88	87	81	79	78	77
Garrison	*Alopecurus arundinaceus*	B	1969	90	92	94	90	95	90	91	86	94	84
Elida	*Andropogon hallii*	L	1969	63	63	78	75	70	65	65	69	59	60
Lutana	*Astragalus cicer*	B	1969	15+76	15+75	57+35	40+16	37+13	56+10	14+9	85+4	14+4	75+3
Wytana	*Atriplex canescens*	B	1968	6*	29*	7*	6*	9*	8*	7*	7*	6*	4*
Vaughn	*Bouteloua curtipendula*	L	1968	94	91	79	84	81	77	76	75	80	32
Lovington	*Bouteloua gracilis*	L	1969	67	70	63	64	46	67	42	63	51	44
Regar	*Bromus biebersteinii*	A	1969	92	90	93	92	86	91	85	68	77	68
Manchar	*Bromus inermis*	P	1969	95	92	91	90	88	90	85	83	70	46
Goshen	*Calamovilfa longifolia*	B	1969	66	80	77	76	67	74	66	68	38	55
Chemung	*Coronilla varia*	A	1969	10+84	21+74	17+80	4+76	16+80	21+72	20+76	23+74	20+77	20+74
Latar	*Dactylis glomerata*	P	1968	92	86	82	86	86	82	79	93	85	69
P-5797	*Elymus cinereus*	A	1969	87	94	94	95	92	96	93	92	96	87
P-15594	*Elymus triticoides*	B	1969	55	80	62	65	59	61	54	63	77	59
Kenmont	*Festuca arundinacea*	B	1968	94	98	98	98	96	95	94	94	87	71
Eski	*Onobrychis viciaefolia*	B	1969	92	90+6	80+8	88+5	89+4	87+8	87+5	92+3	86+8	76+1
P-2575	*Oryzopsis hymenoides*	A	1969	0	1	4	5	2	1	1	4	2	22
P-15599	*Panicum virgatum*	B	1969	60	76	72	72	72	78	72	68	65	63
Llano	*Sorghastrum nutans*	L	1969	52	73	81	76	74	79	75	75	70	69
P-15617	*Sporobolus airoides*	L	1969	77	62	70	76	73	72	75	79	76	66
P-15604	*Stipa viridula*	B	1969	12	7	4	29	47	25	33	32	34	35

1/ B = Bridger, P = Pullman, A = Aberdeen, L = Los Lunas.

* Filled utricles germination.

TABLE 2. Project IX. Inter-Center Seed Longevity Study. Yearly germination of 25 grass, legume, and browse species stored at Aberdeen, Idaho. 1970-1978.

Accession	Species	Seed Origin [1/]	Yr. Grown	Original Germination	Germination 1970	1971	1972	1973	1974	1975	1976	1977	1978
					%	%	%	%	%	%	%	%	%
Critana	*Agropyron dasystachyum*	B	1969	95	96	98	92	94	96	96	88	83	68
Greenar	*Agropyron intermedium*	P	1968	91	90	92	91	85	82	75	61	60	50
P-27	*Agropyron sibiricum*	A	1969	91	98	97	97	96	96	96	95	86	82
Rosana	*Agropyron smithii*	B	1969	87	93	89	92	93	92	92	87	68	23
Luna	*Agropyron trichophorum*	P	1969	93	91	88	88	86	89	81	79	66	57
Garrison	*Alopecurus arundinaceus*	B	1969	90	92	95	94	96	96	87	90	93	83
Elida	*Andropogon hallii*	L	1969	63	63	68	71	72	68	69	69	58	55
Lutana	*Astragalus cicer*	B	1969	15+76	15+75	27+64	22+55	24+52	27+45	4+49	44+42	3+44	45+36
Wytana	*Atriplex canescens*	B	1968	6*	29*	7*	4*	8*	8*	8*	5*	9*	6*
Vaughn	*Bouteloua curtipendula*	L	1968	94	91	76	78	74	80	82	76	80	35
Lovington	*Bouteloua gracilis*	L	1969	67	70	63	58	48	58	50	49	55	39
Regar	*Bromus biebersteinii*	A	1969	92	90	93	92	93	89	91	90	66	79
Manchar	*Bromus inermis*	P	1969	95	92	92	91	92	93	92	92	81	64
Goshen	*Calamovilfa longifolia*	B	1969	66	80	79	66	68	78	70	65	44	44
Chemung	*Coronilla varia*	A	1969	10+84	21+74	18+77	4+83	11+82	9+78	14+80	17+78	13+80	15+77
Latar	*Dactylis glomerata*	P	1968	92	86	80	85	83	86	83	86	79	65
P-5797	*Elymus cinereus*	A	1969	87	94	92	93	96	92	93	95	93	87
P-15594	*Elymus triticoides*	B	1969	55	80	63	67	69	60	66	68	64	63
Kenmont	*Festuca arundinacea*	B	1968	94	98	96	99	97	97	96	93	93	76
Eski	*Onobrychis viciaefolia*	B	1969	92	90+6	90+4	89+6	90+3	88+7	88+5	88+4	87+5	80+2
P-2575	*Oryzopsis hymenoides*	A	1969	0	1	0	1	1	0	1	1	1	3
P-15599	*Panicum virgatum*	B	1969	60	76	73	70	60	59	69	62	72	58
Llano	*Sorghastrum nutans*	L	1969	52	73	72	76	75	75	75	78	67	67
P-15617	*Sporobolus airoides*	L	1969	77	62	72	73	74	64	73	72	75	73
P-15604	*Stipa viridula*	B	1969	12	7	4	7	10	8	6	2	10	8

1/ B = Bridger, P = Pullman, A = Aberdeen, L = Los Lunas.

* Filled utricles germination.

TABLE 3. Project IX. Inter-Center Seed Longevity Study. Yearly germination of 25 grass, legume, and browse species stored at Los Lunas, New Mexico. 1970-1978.

Accession	Species	Seed Origin[1/]	Yr. Grown	Original Germination	Germination 1970	1971	1972	1973	1974	1975	1976	1977	1978
					%	%	%	%	%	%	%	%	%
Critana	*Agropyron dasystachyum*	B	1969	95	96	93	95	92	86	83	63	52	35
Greenar	*Agropyron intermedium*	P	1968	91	90	89	81	77	68	48	54	33	25
P-27	*Agropyron sibiricum*	A	1969	91	98	97	97	96	91	73	61	38	22
Rosana	*Agropyron smithii*	B	1969	87	93	92	88	83	76	66	59	28	47
Luna	*Agropyron trichophorum*	P	1969	93	91	84	86	81	77	70	66	51	19
Garrison	*Alopecurus arundinaceus*	B	1969	90	92	95	85	85	96	82	90	91	78
Elida	*Andropogon hallii*	L	1969	63	63	74	81	79	69	65	66	63	60
Lutana	*Astragalus cicer*	B	1969	15+76	15+75	38+42	27+35	37+26	38+31	15+23	66+23	8+21	59+16
Wytana	*Atriplex canescens*	B	1968	6*	29*	8*	6*	7*	9*	8*	7*	9*	3*
Vaughn	*Bouteloua curtipendula*	L	1968	94	91	80	78	78	76	74	75	71	27
Lovington	*Bouteloua gracilis*	L	1969	67	70	63	60	48	51	54	63	55	33
Regar	*Bromus biebersteinii*	A	1969	92	90	92	88	83	85	82	68	69	58
Manchar	*Bromus inermis*	P	1969	95	92	91	90	85	83	71	58	54	24
Goshen	*Calamovilfa longifolia*	B	1969	66	80	83	75	67	67	61	55	35	38
Chemung	*Coronilla varia*	A	1969	10+84	21+74	26+72	10+70	32+62	26+63	29+65	35+57	35+57	36+55
Latar	*Dactylis glomerata*	P	1968	92	86	83	82	81	75	80	75	77	52
P-5797	*Elymus cinereus*	A	1969	87	94	95	97	96	95	92	94	89	74
P-15594	*Elymus triticoides*	B	1969	55	80	62	72	59	61	50	46	43	59
Kenmont	*Festuca arundinacea*	B	1968	94	98	97	96	86	92	77	65	44	23
Eski	*Onobrychis viciaefolia*	B	1969	92	90+6	90+5	83+5	90+3	87+7	85+7	84+7	75+15	61+1
P-2575	*Oryzopsis hymenoides*	A	1969	0	1	31	19	7	20	7	18	11	49
P-15599	*Panicum virgatum*	B	1969	60	76	78	68	69	61	63	68	63	61
Llano	*Sorghastrum nutans*	L	1969	52	73	80	75	80	71	71	69	48	62
P-15617	*Sporobolus airoides*	L	1969	77	62	73	77	74	68	67	77	73	66
P-15604	*Stipa viridula*	B	1969	12	7	57	35	43	53	43	27	41	31

B = Bridger, P = Pullman, A = Aberdeen, L = Los Lunas.

* Filled utricles germination.